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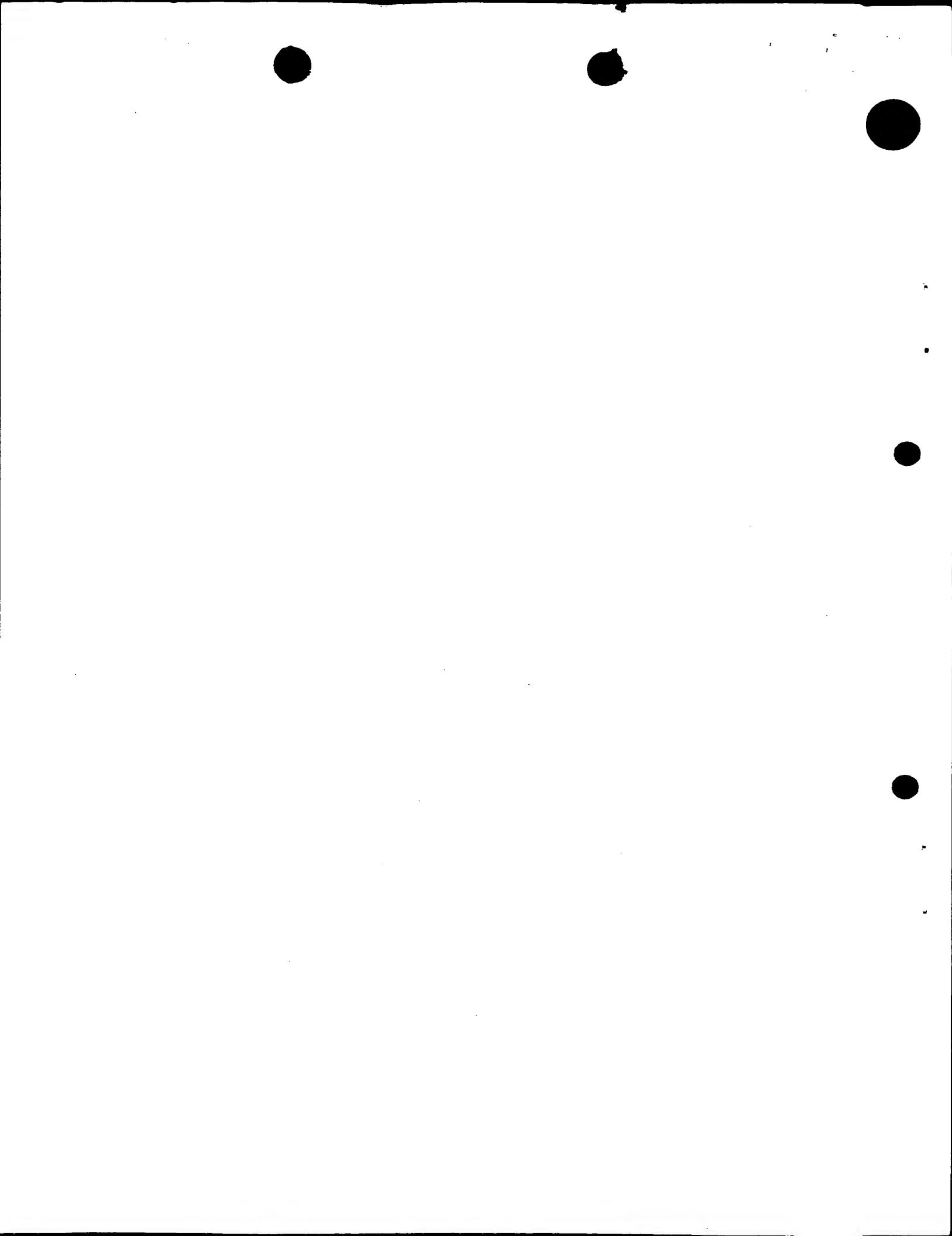
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Signed *Andrew George*
Dated 10 March 2000



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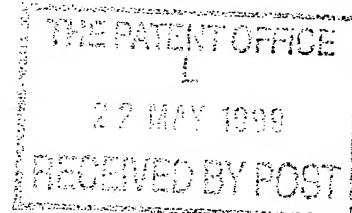
1. Your reference 5483UK

2. Patent application number
(The Patent Office will fill in this part) 9911874.73. Full name, address and postcode of the or of each applicant *(underline all surnames)*McGill Technology Limited
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West Malling
KENT ME19 5TWPatents ADP number *(if you know it)*

06755417002

If the applicant is a corporate body, give the country/state of its incorporation

GB



4. Title of the invention FOOD TREATMENT

5. Name of your agent *(if you have one)* Lewis & Taylor"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*5 The Quadrant
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Country

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Number of earlier application

Date of filing
*(day / month / year)*8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'yes' if:*
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11. I/We request the grant of a patent on the basis of this application.

Signature *Lewis Taylor*

Date
21 May 1999

12. Name and daytime telephone number of person to contact in the United Kingdom David R Cowan
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FOOD TREATMENT

This invention relates to food treatment and in particular to food treatment apparatus and a method of treating food prior to consumption. The invention may find particular application in treating frozen products such as ice-cream and milkshakes and in dispensing such products 5 to the consumer.

Frozen products are frequently stored at low temperatures, such as in the range -18°C to -25°C for preservation of the product over long periods. However the consistency of these products at such low temperatures is usually unsuited to consumption and the temperatures must be raised to higher temperatures below 0°C and usually above -12°C for consumption.

10 This is also particularly true of products which are extruded from containers for consumption since extrusion is not normally possible for frozen product at low temperatures. Frozen milkshake products also require to be heated to bring them to a temperature suited to blending. Sometimes product may need to be heated to above 0°C for consumption.

15 Usually the low temperature product is warmed or tempered to reach the desired higher dispensing temperature in an environment at the higher temperature, but this can pose problems in the time taken, in knowing whether the product has reached the desired temperature and in selecting product which has been tempered for a sufficient period.

It is an object of the invention to provide an improved food treatment method and apparatus.

According to the invention there is provided a method of preparing a food product for 20 consumption in which the food product is charged into a container, the container is sealed and then cooled to a low temperature, for example in the range -18°C to -25°C and is stored at that temperature, the food product is made ready for consumption by heating the product to a temperature, for example above -12°C, and the food product is dispensed by extrusion from the container, or by blending in the container, the heating of the food product being 25 performed by locating the container in a microwave environment for a sufficient period to

effect said heating, taking account of the product temperature on entry into said environment and the desired higher temperature of the product.

Preferably the container is located in transport means for transport into the microwave environment for a predetermined period, the transport means directing the container after

5 heating towards a dispensing station at which the product is blended or extruded from the container, the heating environment and the dispensing station being located adjacent to one another.

According to a further aspect the invention provides food treatment apparatus comprising a container for food product, means for blending the product in or extruding the food product

10 from the container, heating means for subjecting the food product to microwave heating prior to blending or extrusion, and transport means for transporting the container into the heating environment and for discharging the container with heated product towards a product blending or extrusion station at which the product is blended in or extruded from the container.

15 Preferably the apparatus includes a compartment in which heating of the food product is effected by microwave radiation and the transport means includes a holder in which the container located and is moved from outside said compartment and into said compartment, there being an opening or openings into the compartment which is provided with a closure or closures for closing the compartment during heating. Inlet and outlet closures may be
20 provided.

In one arrangement the apparatus includes transport means for transporting the container from the compartment towards the blending or extrusion station at which drive means blends the product in the container or discharges the food product from the container by extrusion through an outlet opening in the container.

25 Further features of the invention will appear from the following description of embodiments of the invention given by way of example only and with reference to the drawings, in which:

Fig 1 shows a vertical section through apparatus of the invention,

Fig 2 shows a vertical section corresponding to part of Fig 1 at a different stage of the operating procedure,

Fig 3 shows an alternative embodiment of the apparatus;

5 Fig 4 is a side elevation of a further embodiment of the invention,

Fig 5 is a view in the direction 5 of the embodiment of Fig 4 in one position,

Fig 6 is a view corresponding to Fig 5 in another position,

Figs 7A and 7B are plan views of two stages in loading a container,

Fig 8 is a side elevation of another container loading arrangement,

10 Fig 9 is a plan view of the arrangement of Fig 8,

Figs 10, 11 and 12 show, in vertical section, three stages in a heating and blending operation,

Fig 13 shows a view in direction 13 in Fig 10, and

Fig 14 shows a side view of another form of apparatus for a heating and blending operation,

Fig 15 shows in plan view another form of heating arrangement, and

15 Figs 16-20 show pictorial views of another apparatus in various stages of use.

Referring to the drawings Figs 1-3 relate to apparatus for heating and dispensing product by extrusion. In Figs 1-3 there is shown a combined heating and dispensing apparatus for ice-

cream or other food products which need to be heated up before dispensing. The lower part 10 of the apparatus comprises the heating means and the upper part 11 comprises the dispensing means. The heating means 10 includes a housing 12 on the upper side of which is mounted the dispensing means 11.

- 5 Within the housing 12 food product within a container 13 is heated from a low temperature, for example in the range -18°C to -25°C to a higher temperature, usually below 0°C and above -12°C. However the heating means is suited to heating the food product to any desired temperature.

The container 13 is formed of plastics material and is pre-filled with food product which is 10 then frozen at the desired low temperature for storage purposes, the product being sealed within the container 13. To heat the product within the container 13, the container is placed in a holder 15 mounted on the end of a reciprocal rod 16, driveable reciprocally by drive means 17. In this way the holder 15 is moved in and out of a heating compartment 18 through an opening 19 for which there is a closure 20.

- 15 To introduce the container 13 into the enclosure or compartment 18, the container 13 is placed in the holder 15, the rod 16 is drawn in by the drive means 17 in its lengthwise direction until the holder 15 is within the compartment 18, with the closure 20 in its upper position, as shown in Fig 2. After entry into the compartment 18 the closure 20 is moved downwards to close the opening 19 so that the compartment 18 is now closed. In this 20 position the product within the container 13 is subjected to microwave radiation so as to heat up the product to a higher, predetermined temperature. The microwave radiation generation means is located in a housing 22 and is arranged to direct radiation at the defined area occupied by the product within the container 13. The compartment 18 is arranged to ensure that the microwave radiation is contained within the compartment 18 by providing suitable 25 shielding.

The apparatus may include temperature scanning means 23 whereby the temperature of the product within the container 13 is determined before its entry into the compartment 18.

Information concerning the temperature is programmed into the microwave radiation means so that the required amount of heating of product takes place within the compartment 18 to bring the product temperature up to the desired higher temperature. However if the input temperature is closely controlled and therefore predictable it may not be necessary to monitor
5 the input temperature.

A further scanner 24 may also be provided to scan the container 13, for example by a barcode, and pick up information from the container 13 concerning the product within the container 13 so that, for different products, a different heating time can be programmed. The scanners 23, 24 may supply such data to a central processor for processing and storage and
10 may be located outside (as shown) or inside the compartment 18.

The scanner 24 may also detect other information on the container 13 such as price information, 'sell by' information, size of container, stocking information, and the like, which may also be centrally processed and stored. If the 'sell by' date has passed the processing system can prevent the product being dispensed. The scanner may also detect if
15 a non-conforming container is placed in the apparatus.

Upon completion of the heating step the container 13 is discharged from the compartment 18 by opening the closure 20, reversing the movement of the rod 16 so that the holder 15 is presented externally of the housing 10 for removal of the heated container 13 from the holder
15.

20 The container 13 is then ready for discharge of the food product from the container 13 by the use of the dispensing mechanism of the dispensing unit 11 mounted on the housing 12. The dispensing mechanism is conveniently of the kind by which product in the container 13 is extruded from a lower outlet opening by engagement of drive means with a deformable, upper portion of the container 13 which reduces the internal volume of the container and
25 causes the product to be extruded through the outlet into a receptacle such as a cone or dish. A suitable dispensing mechanism and container are disclosed in earlier patent specification EP 0 674 482.

Referring now particularly to Fig 3 of the drawings alternative apparatus is shown by which heated containers 13 are transported directly from a heating compartment 18 to a product dispensing position. In the Fig 3 embodiment similar components are given the same reference numbers as those in the embodiment of Figs 1 and 2.

- 5 In the Fig 3 embodiment the container 13 and holder 15 are transported in a similar manner to that shown in Figs 1 and 2 into a heating compartment 18. Upon heating the holder 15 is moved along an inclined path into a seating for a dispensing and discharge operation by which product is extruded from the container 13 by drive means 26 including a plunger 27, for example in the manner described in EP 0 674 482. The empty container may then be
- 10 removed from the holder 15. Full containers may be located in the holder 15 when it is returned to a position inside the compartment 18 with the door 20 open. The door 20 is then closed and the product in the container heated by microwave radiation. The heated product in the container is then moved to the dispensing position by operation of the drive means 17. The plunger 27 may have a fast return facility to speed up a dispensing cycle. Detecting
- 15 means X may be employed to detect the correct position and location of containers and to prevent operation in the event of incorrect location.

Referring now to Figs 4-9 there is described combined apparatus for heating and dispensing product to be extruded from a container (as for the embodiments of Figs 1-3) and/or products to be blended before consumption, for example, milkshake products.

- 20 In Figs 4-6 there is shown apparatus for heating and blending frozen milkshake product. The blending arrangement used may be in accordance with our prior patent application No. PCT/GB98/03193 in which there is described a container 30 into which the product is charged for storage and for transportation to the point of consumption. The product may be frozen in the container for storage. The container has a blending element (not shown) for driving engagement with drive means and to effect a blending action on the product but, before blending of the frozen product can be effected, the product needs to be heated to raise its temperature from the storage temperature to a blending and consumption temperature.
- 25

The illustrated apparatus of Figs 4-6 is intended to enable the heating and blending actions to be performed successively and for heating and extrusion of frozen product in a container 31 to be performed on another part of the apparatus.

For the heating and blending actions there is provided a holder 32 which is mounted on an
5 arm 33 which in turn is moveable vertically along a guide rod 34 supported at its ends on supports 35 and 36. The arm 33 is moveable in the vertical direction by a drive 37 having a rod 38.

The container 30 filled with frozen product is located in a compartment 39 of the apparatus to be subjected to microwave radiation in said compartment in order to heat up the product
10 to a blending temperature. The microwave radiation is focussed on product within the container 30 to conserve power, and the duration of the heating is such as to heat up the product from the low temperature to the desired blending temperature.

After heating the container 30 is placed in a holder 32 and is lifted up towards a drive motor
15 42 having a drive shaft 43. When the container 30 has reached its upper most position the drive shaft 43 engages with a blending element (not shown) in the container 30 to effect the blending operation. Thereafter, the holder 32 is lowered again to its initial position for removal of the container with blended product from the holder 32. If required the arm 32 may be longitudinally extendable and retractable to present the holder 32 in a forward position, clear of the compartment 40, in which easier access to the holder 32 may be
20 obtained.

The holder 32 may be pivoted about a horizontal axis to improve access to containers in the holder.

Along side the compartment 40 is provided a product dispensing mechanism 45 of the kind described in patent specification No. PCT/GB95/01557 whereby product in a container may
25 be extruded therefrom into a receiver. Such product also requires to be tempered or warmed to a dispensing temperature from a low temperature and the microwave heating facility on

the apparatus may be used for this purpose also, the containers for the apparatus 45 being placed in the compartment 39 for the tempering step before being removed for a dispensing operation.

Referring now to Figs 7A and 7B there is shown another means for locating containers with products to be heated in a heating compartment 50. In this case the holder 32 is mounted on one side of a door 33 pivoted about a vertical pivot 34. The container of product is located in the holder 32 when the door 33 is in the open position (Fig 7B), the door 33 is pivoted to the closed position (Fig 7A) in which the holder 32 and accompanying container are located within the compartment 50 to be subjected to microwave heating. When the heating is completed the door is opened to gain access to the container.

Referring now to Figs 8 and 9 there is shown another form of heating unit again including a door 33 pivotable about a pivot or hinge 34 to access a heating compartment 50. Within the heating compartment 50 are upper and lower microwave plates 51 and 52 between which the container and holder 32 are located when in position in the compartment 50. The two plates 51 and 52 form an enclosed cylinder to give total control of the microwave energy.

As another alternative, shown in Fig 15, a cylinder 55 with a vertical axis can be formed by one half 55A of the cylinder being inside the compartment 50 in a fixed position with another half 55B mounted on the door 33 so that when the door is closed the two halves match up to form a cylinder enclosing the container.

Referring now to Figs 10-13 there is shown another arrangement by which a heating and blending operation may be performed, these drawings using the same reference numbers for similar parts to the preceding embodiments.

A heating compartment 40 is accessed to introduce a container 30 into a holder 32 through an opening in the compartment having a door 20 moveable vertically to open and close the opening. The holder 32 is pivotally mounted about a horizontal axis 56 to tilt and present the holder 32 for location of the container 30 in the holder (Fig 10). Movement of the holder

after location is towards a vertical position about axis 56. The container is vertically located during a heating and a blending operation.

The holder 32 is mounted on a base portion 57 and is moveable up and down from its location position, Fig 10, through a heating position Fig 11, to a blending position Fig 12.

- 5 In the blending position the container 30, having a blending element 31, is engageable by a drive motor 42 having a drive shaft 42A which is driveably engaged with the blending element to blend the product within the container 30. Return of the container to the position of Fig 10, after blending, allows the container and blended product to be removed from the holder. Raising and lowering of the container towards the blending position is achieved by
- 10 a vertically reciprocating movement using drive means 58 on the upper end of which the holder 32 is mounted. The location of the container 30 in and out of the holder 32 may be made automatically operated for use in, for example, self service applications. For this purpose the seating may be movable in the horizontal direction to present the holder outside the compartment 40 to receive a container. After heating and blending the container is either
- 15 returned to the initial position or out of the compartment to the opposite side through a further opening. In the container discharge position the container may be automatically ejected from the holder.

- In Fig 14 is shown an arrangement similar to that of Figs 10-13 in which the holder 32 is movable horizontally to present the holder for location and removal of the container 30 manually or automatically. The holder is mounted on a reciprocal arm 32A for horizontal movement between a position external to the compartment 40, as shown in Fig 14, and an internal position within the compartment.

- 20 In another arrangement (not shown) the compartment in which microwave heating takes place may be moveable to present the container for a blending/extrusion step.

The source of microwave radiation is located in a suitable position in the apparatus.

Referring now to Figs 16-20 there is shown a combined heating and blending apparatus for

a similar purpose to the apparatus described with reference to Figures 10-13 and in which the same reference numerals are used in respect of similar parts. There is shown in these figures a sequence of steps in manually loading a container 30 into the apparatus, heating the product within the container 30, and blending the product using the apparatus of the invention.

5 Fig 16 shows the apparatus ready for use, with the door 20 in the closed position and the container holder 32 located outside the compartment 40. In Fig 17 the door 20 is moved to the open position, as shown.

In Fig 18 the container 30 is located on the holder 32 which has an upwardly-projecting member 32A which locates in a corresponding opening in the base of the container 30. Thus
10 the container 30 seats on the member 32 and 32A. The holder 32 is slidably movable, as seen in Fig 19 to move the container 30 into the compartment 40 in a horizontal direction. Upon reaching the position shown in Fig 19 the door 20 is closed to the position shown in Fig 20 and the contents of the container are subjected to heating within the microwave environment of the compartment 40. After heating to the desired temperature the contents
15 of the container 30 are blended by engagement of drive means within the apparatus with the blending element within the container 30.

After heating and blending the door 20 is opened, the holder 32 is moved outwardly to its initial position and the container is removed with the product within the container ready for consumption.

20

It will be appreciated that by providing heating means used immediately prior to dispensing of the food product it is no longer necessary to heat up or temper product within a tempering cabinet. This overcomes problems with tempering cabinets, including problems with stock rotation which should operate on a "last in, first out" principle but is difficult to achieve. The
25 need for tempering cabinets is avoided. Moreover the use of tempering cabinets usually involves opening and closing access doors which allows heat into the cabinet. In addition tempering cabinets can usually only be satisfactory if the product dispensing temperature for all products within the cabinet is the same in each case. Without tempering or heating up a

frozen product extrusion or blending of standard product formulations is difficult to achieve.

A further problem with tempering cabinets is that ice can build up within the cabinet, requiring ice removal.

Although these problems can be overcome it may sometimes require a special formulation
5 of product to achieve this. The use of heating apparatus prior to dispensing with the possibility of individual control of the heating operation for each container permits standard formulation of product to be employed and tempering cabinets to be avoided altogether.

The product container can readily be applied with information to determine the amount of heating required, according to the container contents, in each case. For each product a
10 different heating operation can be performed and there is also provision for detecting the temperature of the product before entry into the heating environment.

The holder for the container, whether container for blending product or containers for extruding product, can be arranged to be common to both.

By the use of microwave heating for the specific product container the microwave radiation
15 can be directed specifically at the space occupied by the product and is very confined resulting in efficient use of microwave energy.

The holder may be sanitised after each blending or extrusion step by microwave radiation assisted by a water spray on the holder which is thus subjected to microwave heating to sterilise.

20 Bar coding may be used on the product containers to monitor product and other characteristics which may be useful to the operator such as price, 'sell by' date and stock control information.

Instead of the heating time for the product being calculated automatically the operative can

operate the timer according to the product within the container and the temperature of the product by providing controls, such as push buttons or touch pads, representing target temperatures for the product to be heated. Controls may be provided according to the input temperatures and for the output temperatures. The need for an input temperature scanner can
5 then be avoided. In another arrangement the time taken for heating can be varied by adjusting the power input for the microwave heating unit.

The apparatus may include the facility for two or more heating compartments so that as one container is introduced for heating the other is discharged for dispensing. In this arrangement a common microwave radiation generating unit can be provided which directs microwave
10 energy at one or other of the compartments.

Each container may be colour coded by label or otherwise, each colour representing the required product temperature. A colour code reader may be provided to detect the colour and to determine the required product temperature and, hence, the heating duration for that product.

15 The heating means may be located within or closely adjacent a freezer in which the container is stored at said low temperature and there may be provided means for automatically transferring the container from storage to the heating means.

Heating of product may be directed to heat the centre of the product to a higher temperature than the rest of the product. Sauce and toppings may be injected into the centre of the
20 product at the filling machine for filling product into the container. Thus on extrusion of product from the container the centre of the product is warmer and may be liquid. Similarly toppings on the top of the product may be heated to a higher temperature than the rest of the product.

25 The apparatus described can be provided with functions which enable the apparatus to be operated simply has a self-vending operation or otherwise. A display can be provided on the front part of the equipment in the form of a small visual display unit which may be a liquid

crystal display. The display on the unit may be sourced from a micro-processor which may be in the form of a RAM chip, by using a CD ROM or a DVD disk. By this means it is possible to change the display.

The display can provide messages to the user relating to the operation of the machine to 5 indicate to the user the various steps which need to be taken to effect operation, coupling the display with detectors on the machine which detect at which stage the dispensing operation has reached. In addition the display may include sales aids such as a welcome sign and marketing and selling information.

Associated with the display may be controls by which information such as nutritional data, 10 price, recreational information, flavour choice, the weather forecast may be retrieved from the system. This may be accompanied by audio information including music.

The system may be initiated by the user beginning operation of the apparatus and a user will be provided with instructions for loading and operating the apparatus. If the apparatus includes scanning means for scanning the container chosen by the user it will be able to 15 tailor the information supplied to the product chosen. Furthermore the user may be supplied with information concerning the stage in the operation of the apparatus reached including the time elapsed and the time which will elapse before the product is ready for consumption. The user may initiate operation of the system by inserting a coin or a card. If the use of a card with magnetic strip is employed this could include a special audio message customised 20 to the product. Advertising may be contained on the card to be displayed. Upon completing a dispensing operation of the apparatus the display may switch to advertising messages, advertisements, moving pictures or other material.

In the event that the apparatus is not operated properly or completely, such as when an empty container has not been removed, that customer or the next customer who attempts to operate 25 the apparatus is given the signal on the display requesting removal of the container. If the product is not correctly dispensed a signal to this effect may be transmitted to the user and, in addition, to the attendant. Moreover the system may detect when certain produce flavours

are out of stock and this information may also be transmitted to the attendant. The processor may be connected to a central processor which is capable of transmitting information, upon request, such as information concerning stocks of product.

As another possible facility there may be mounted on the apparatus a camera to observe
5 customers. If the apparatus is not adapted to self-service use the information displayed can be mounted differently to be seen by the customer during operation.

The display may be connected to the internet so that additional information may be displayed.

It may be helpful to have a control whereby the apparatus detects when a service call is
10 required and sends a request to the nearest service technician. Audio facilities can be provided from a voice chip so that additional functions can be provided to those previously described.

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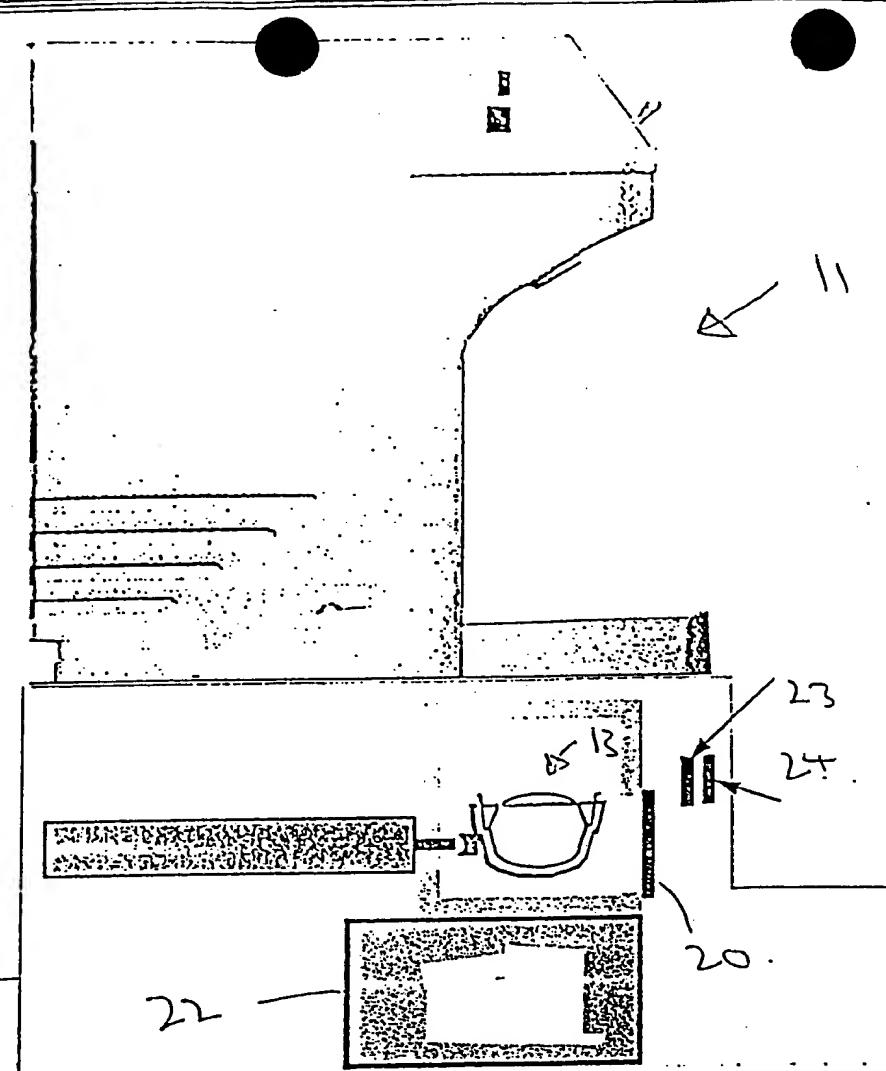


Fig 1

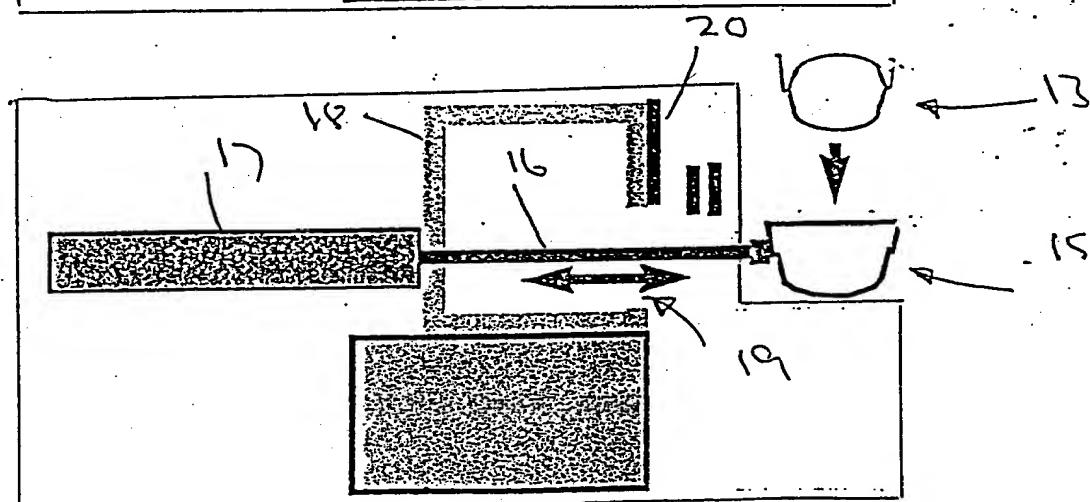
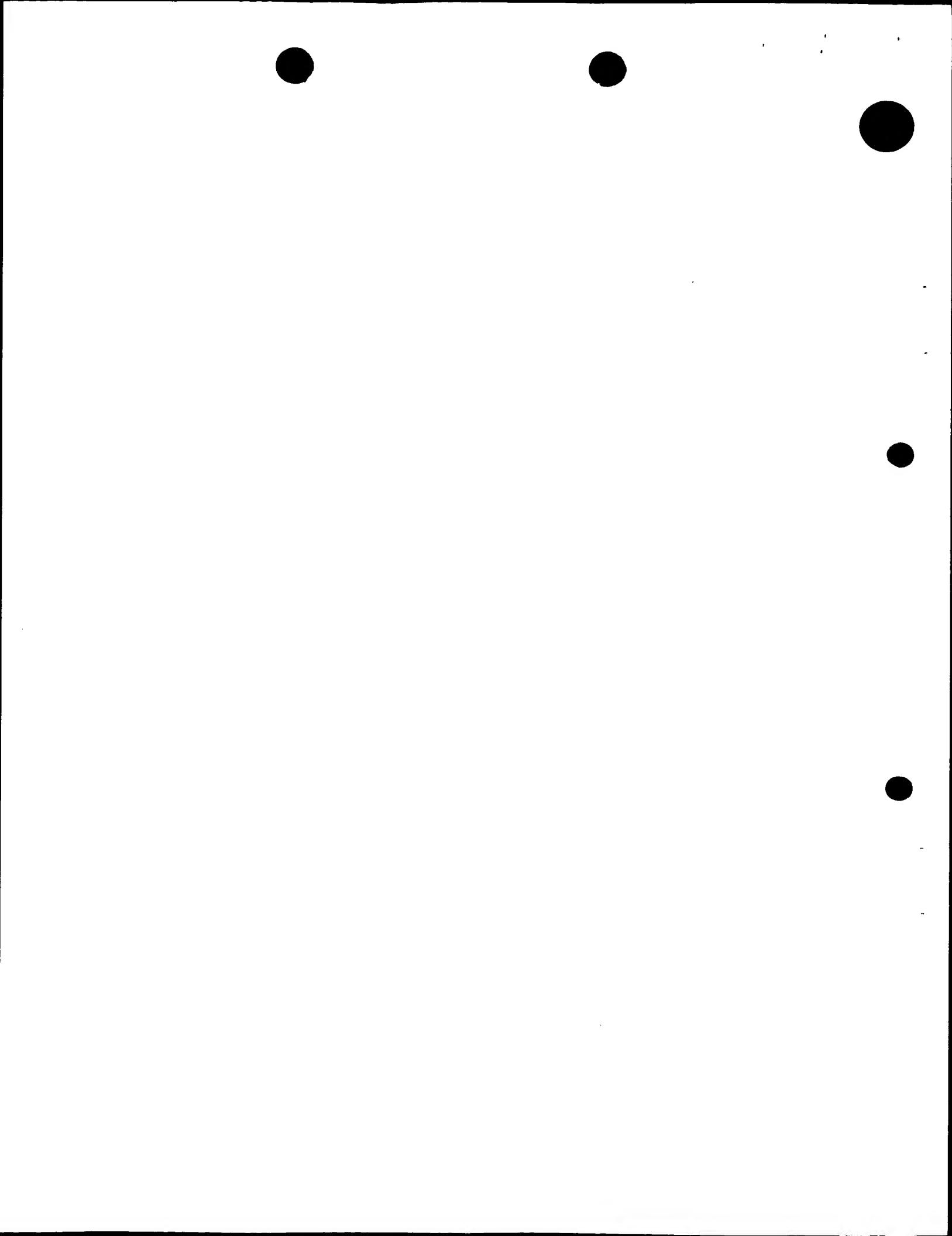


Fig 2

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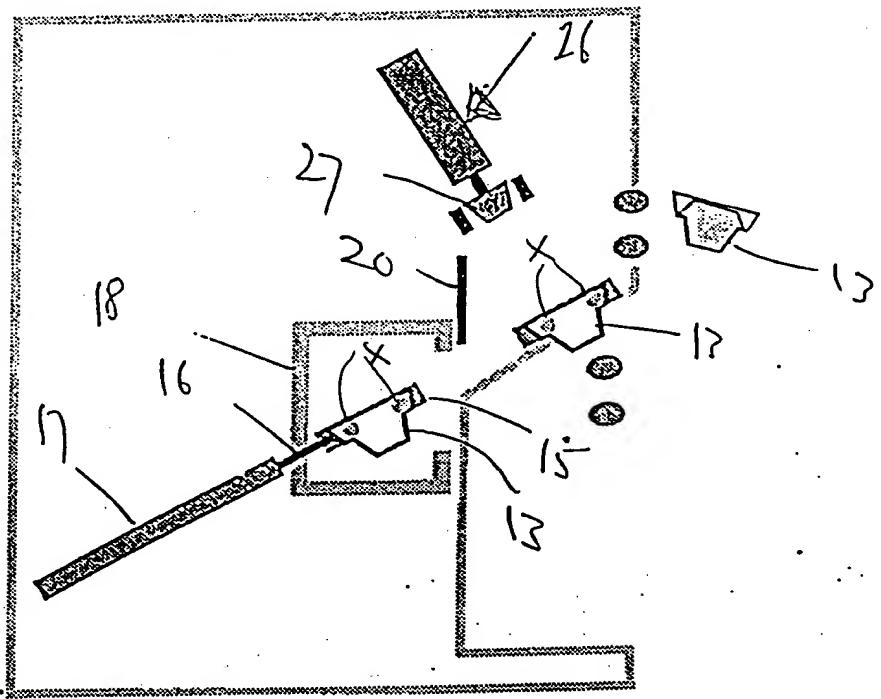
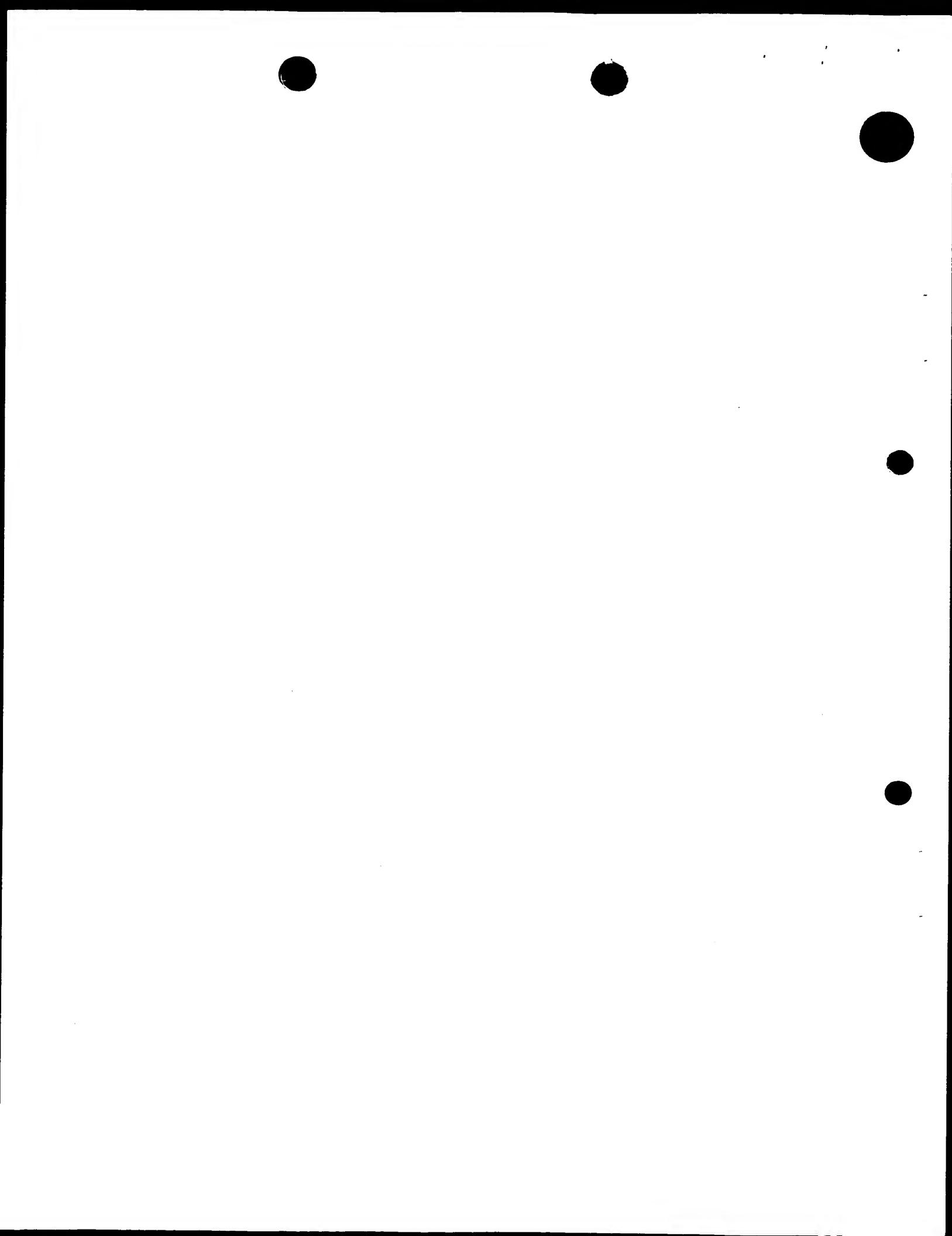


Fig 3



31 14

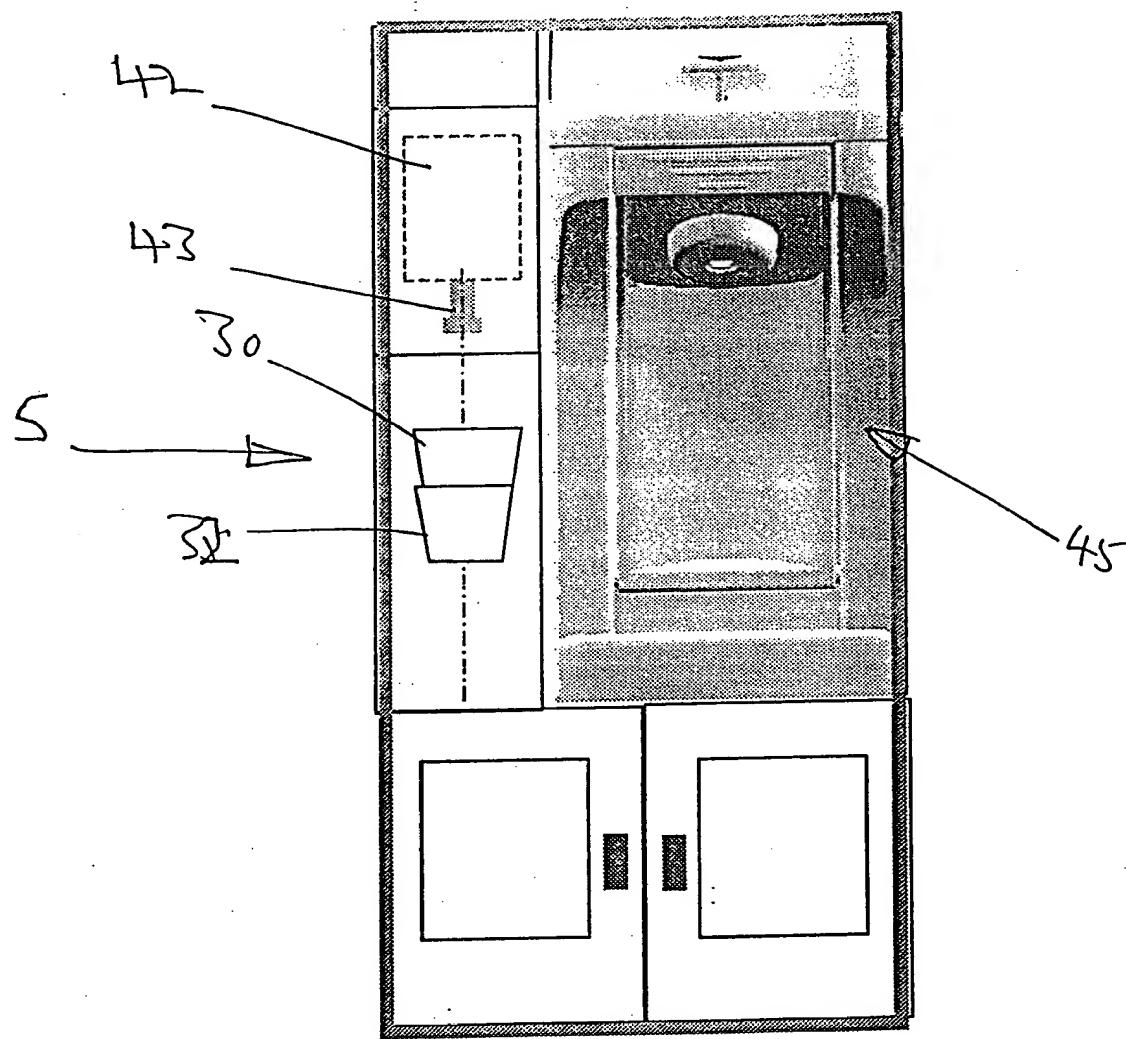
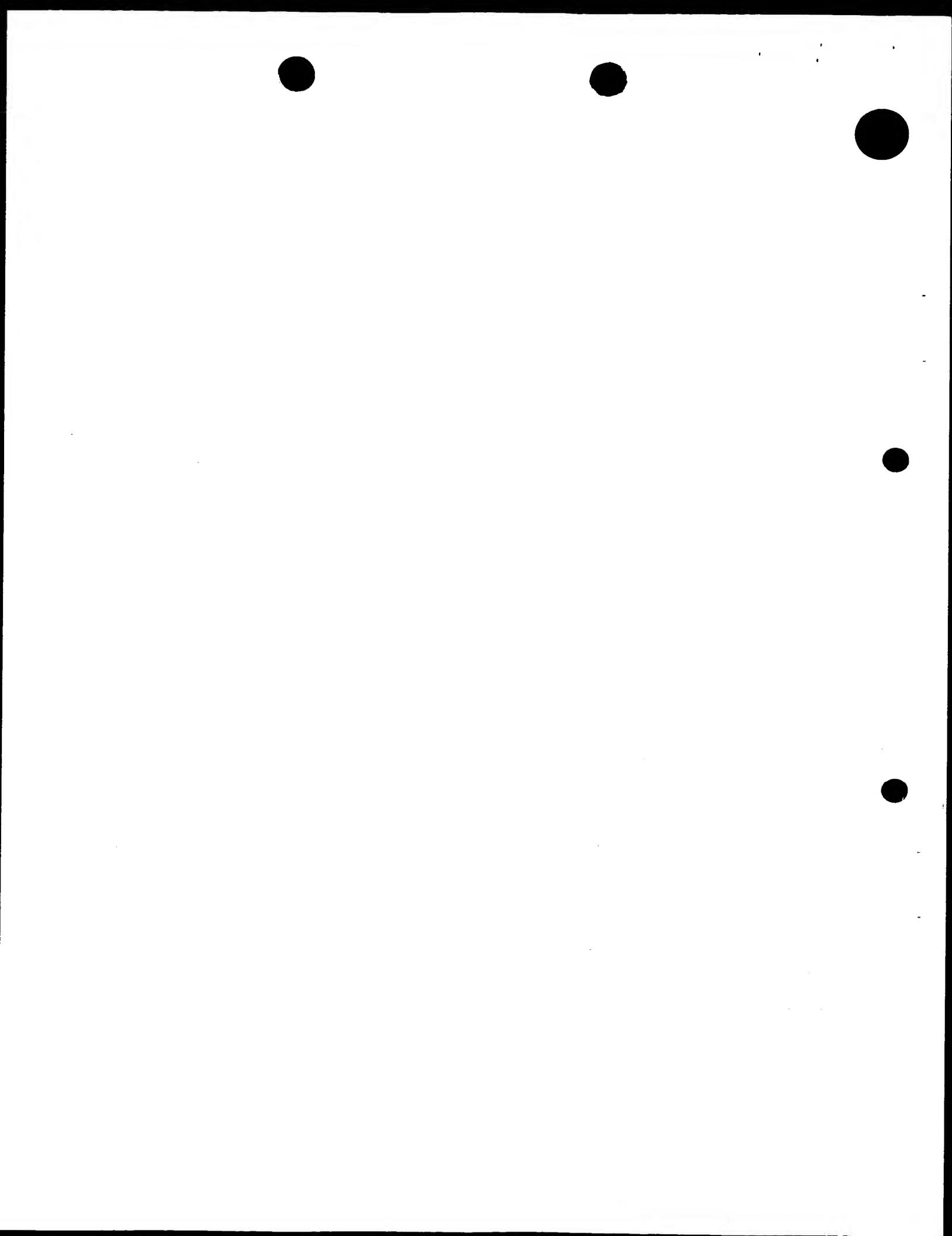


Fig 4

~~FIG 120
PAGE 1 of 5~~



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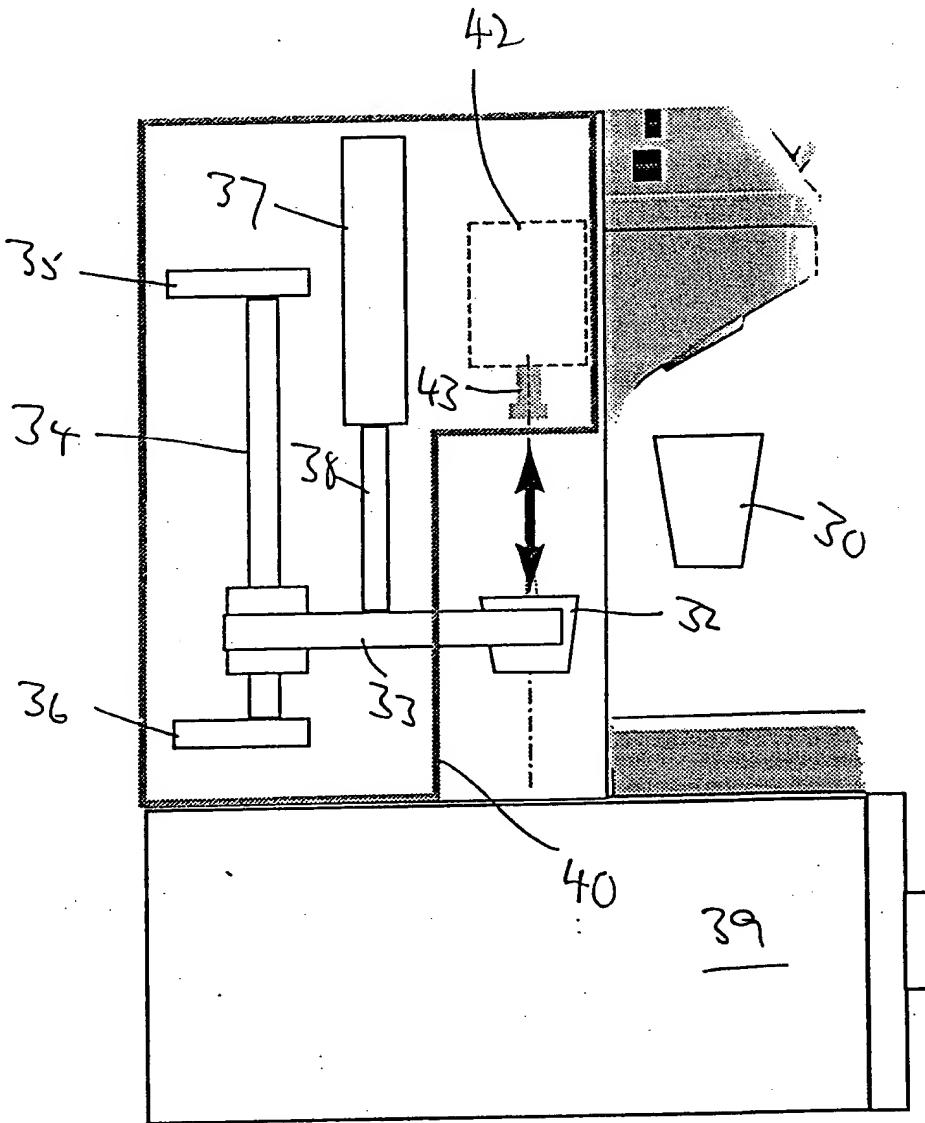
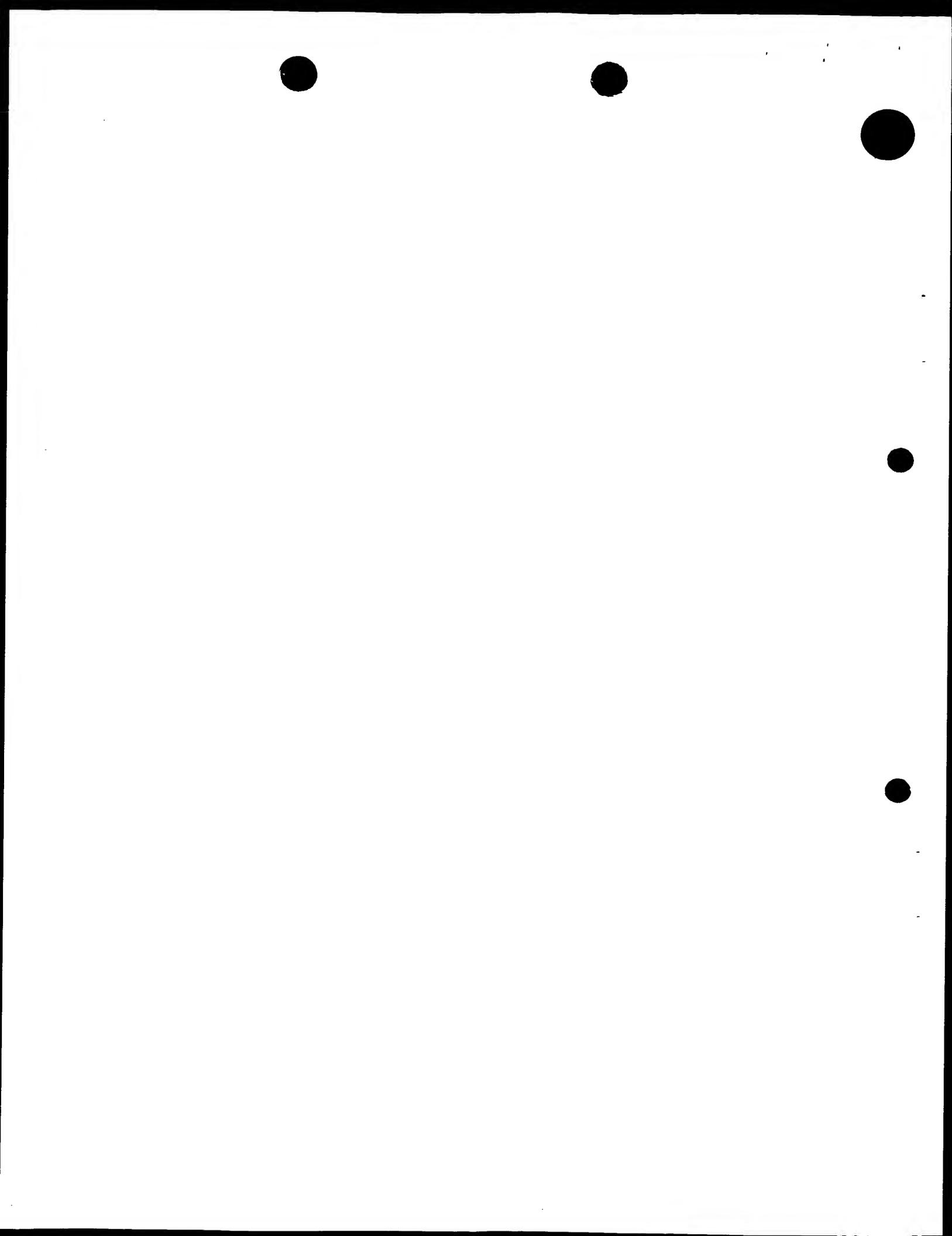


FIG 120
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Fig 5



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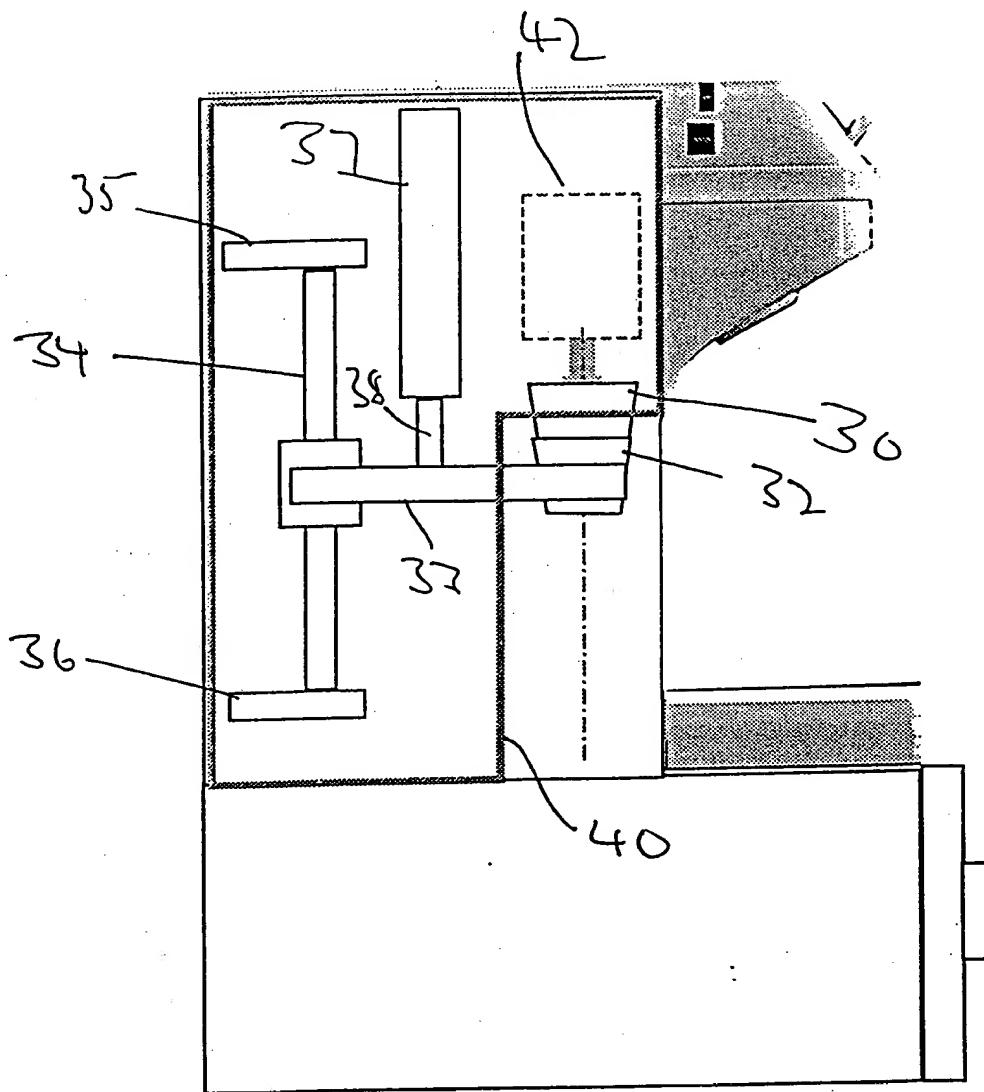
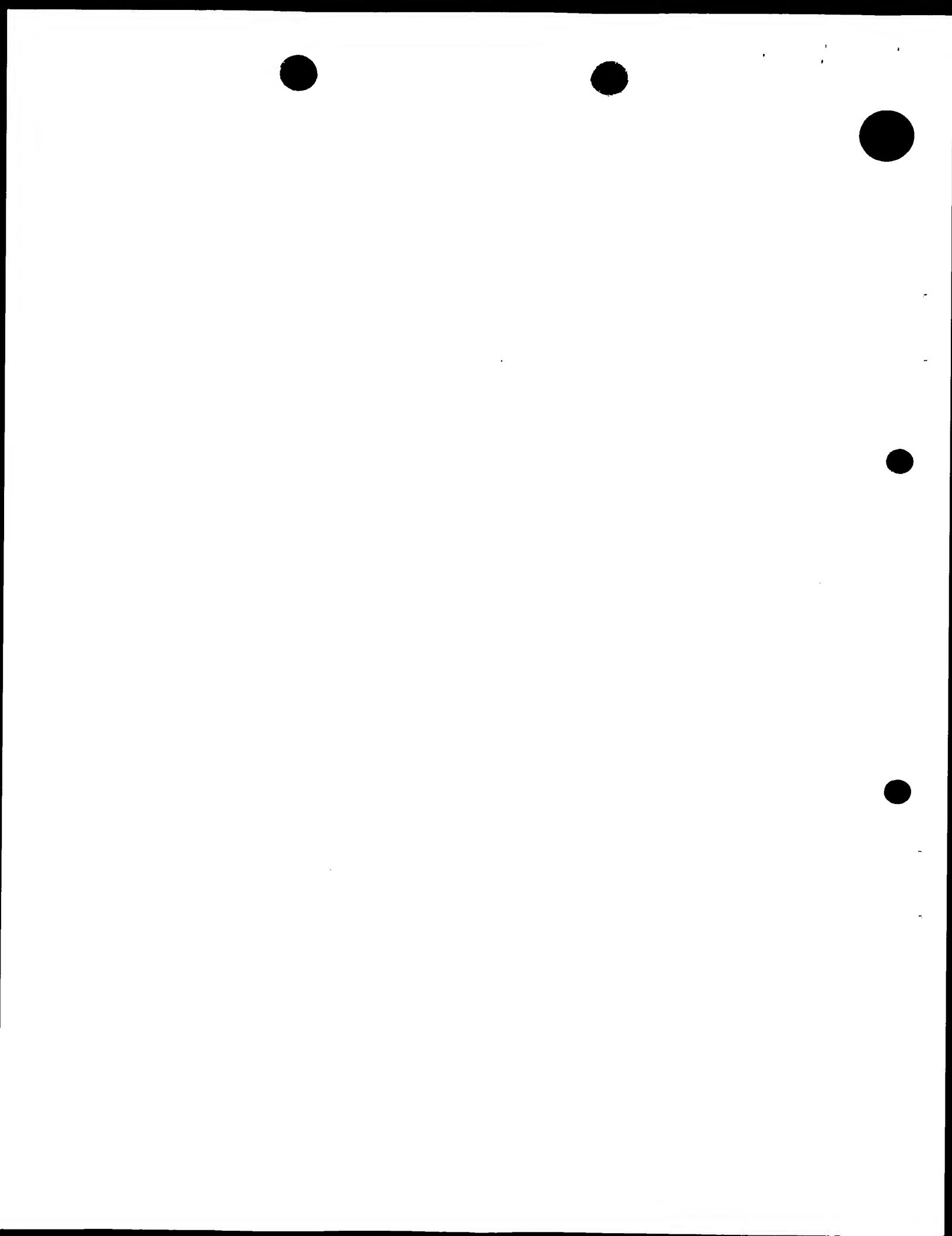


Fig 6.

~~FIG 120
PAGE 3 of 5~~



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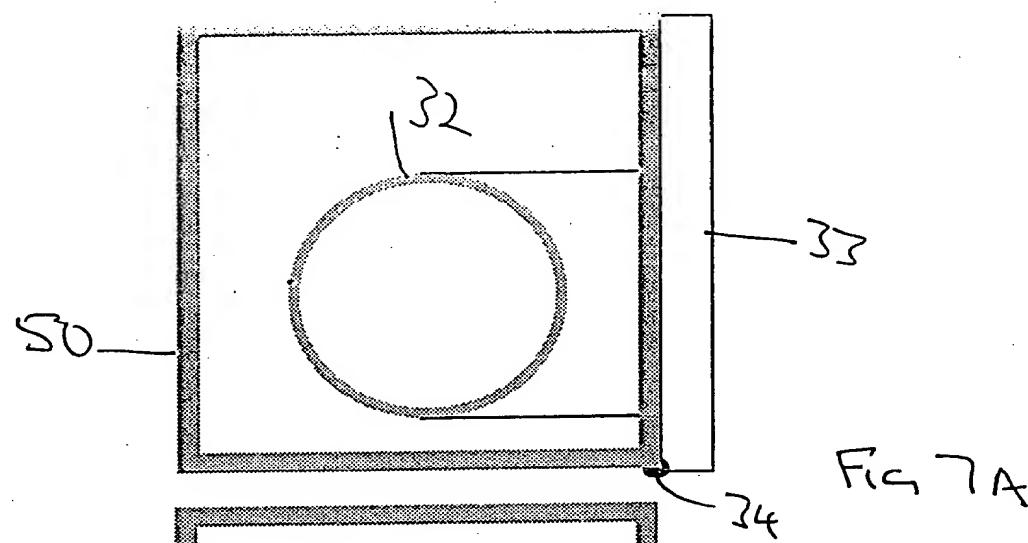


Fig 7A

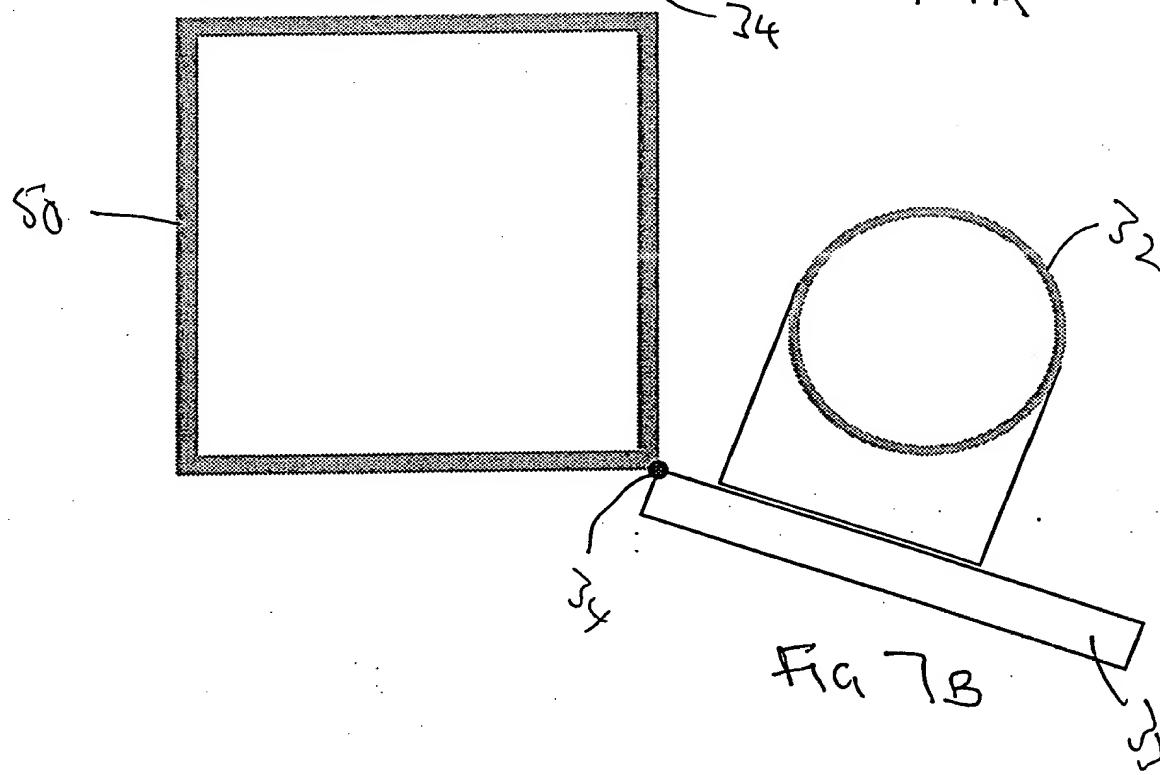
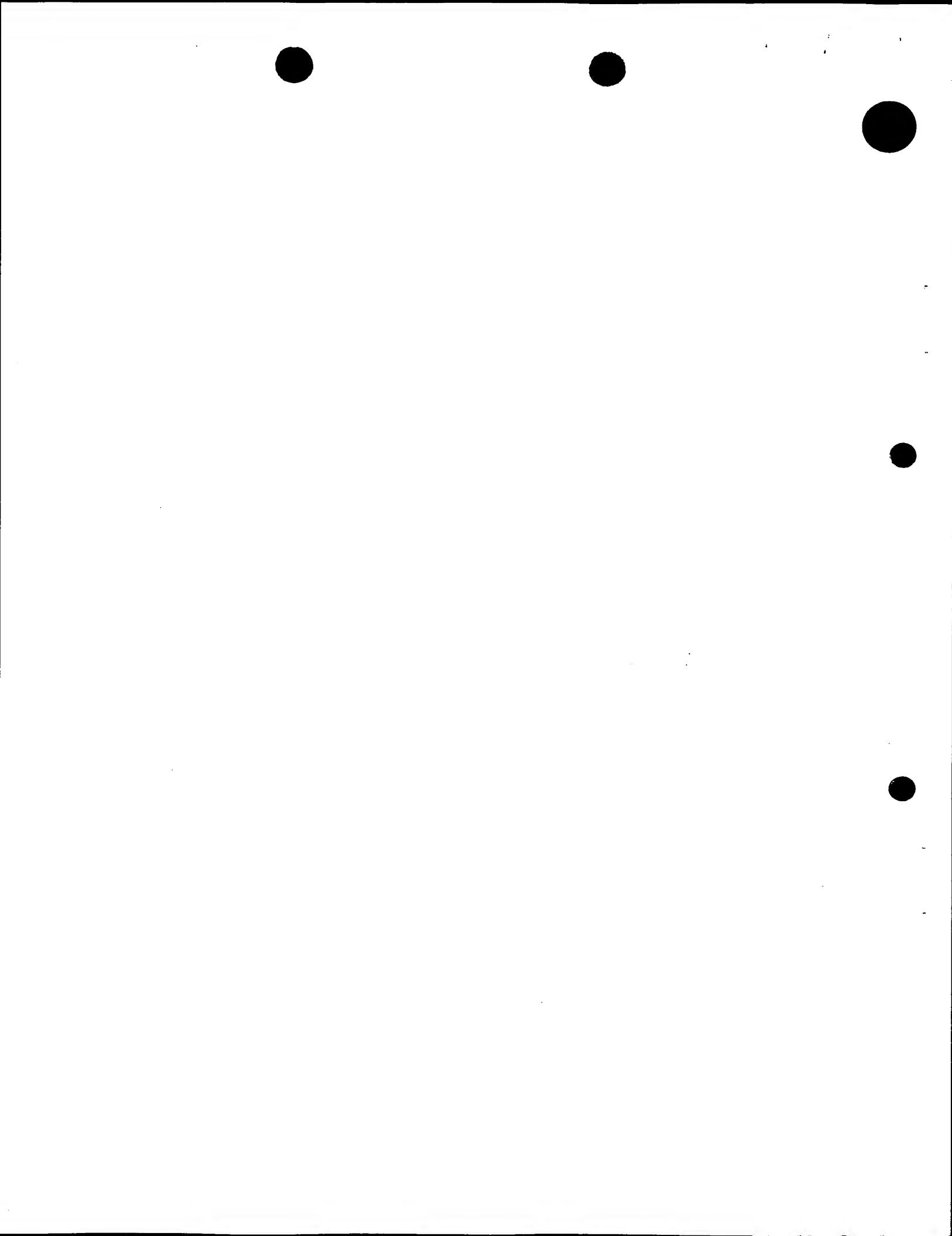


Fig 7B

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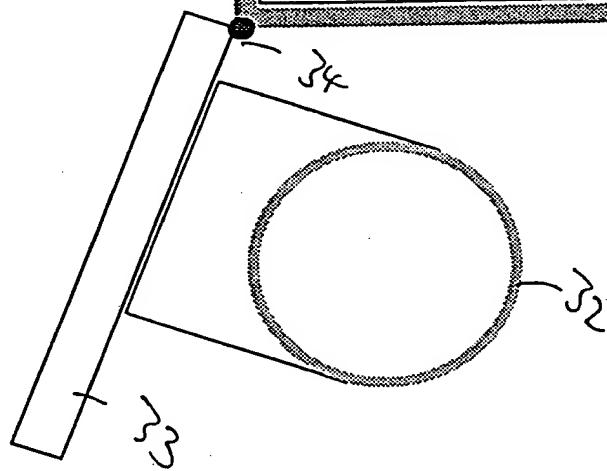
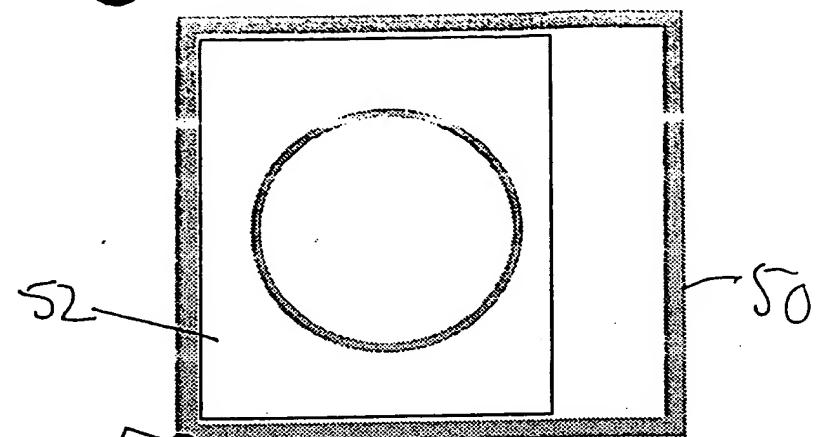


Fig 9

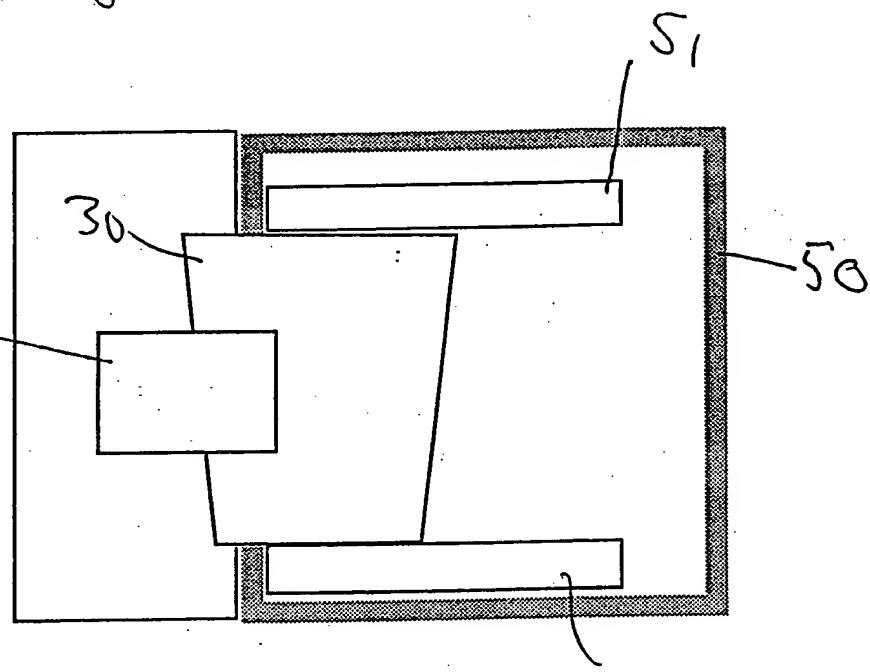
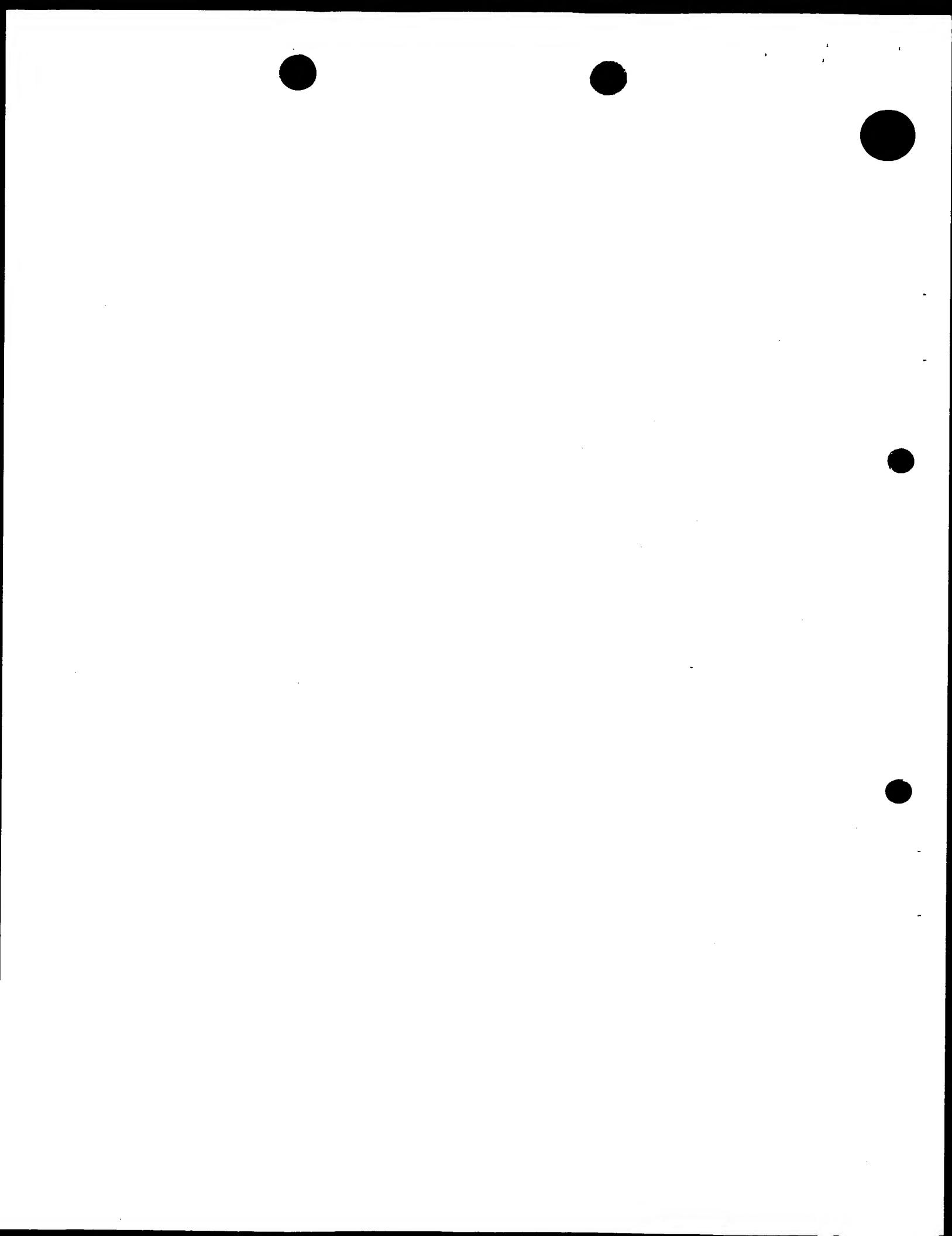
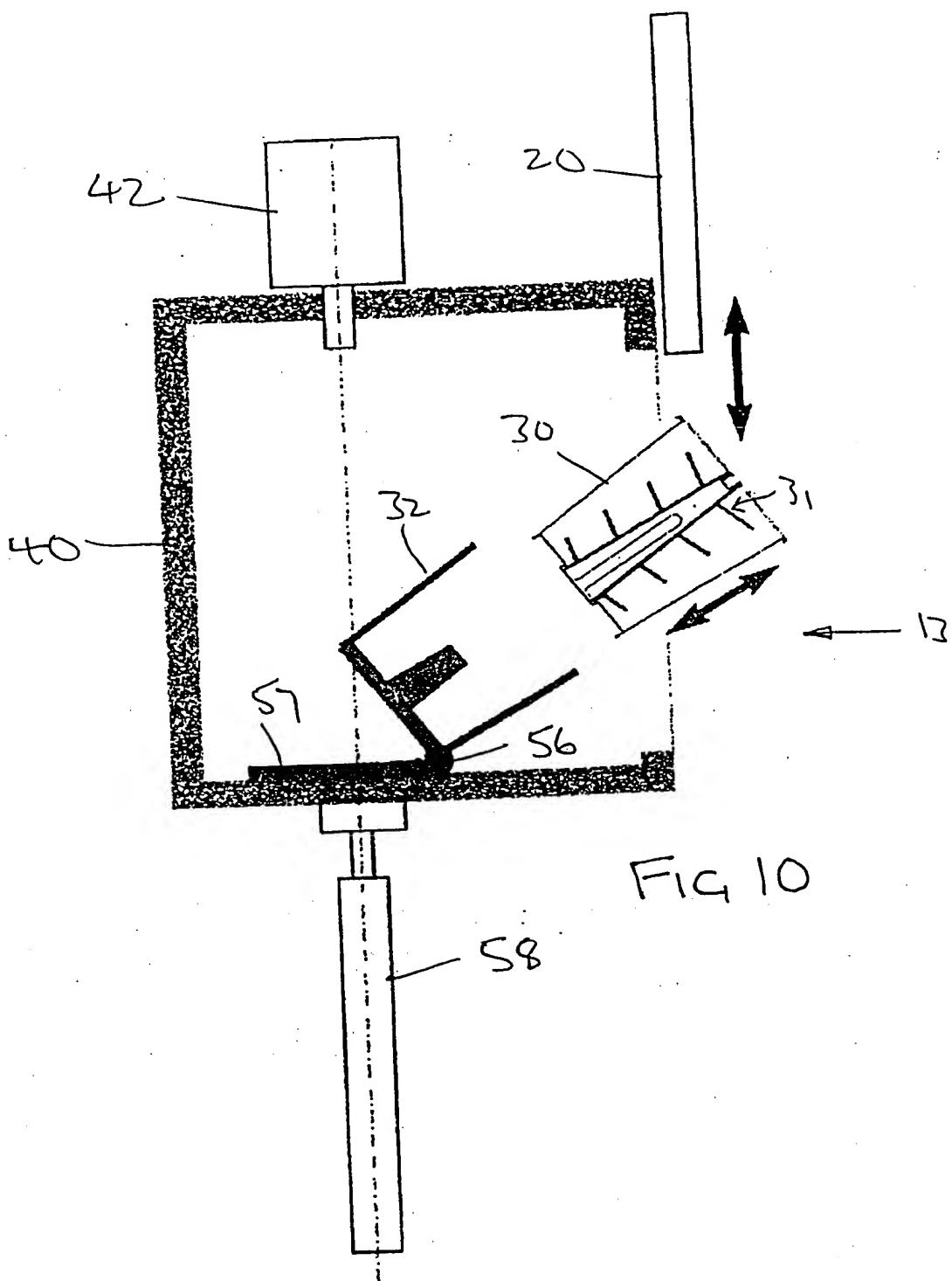


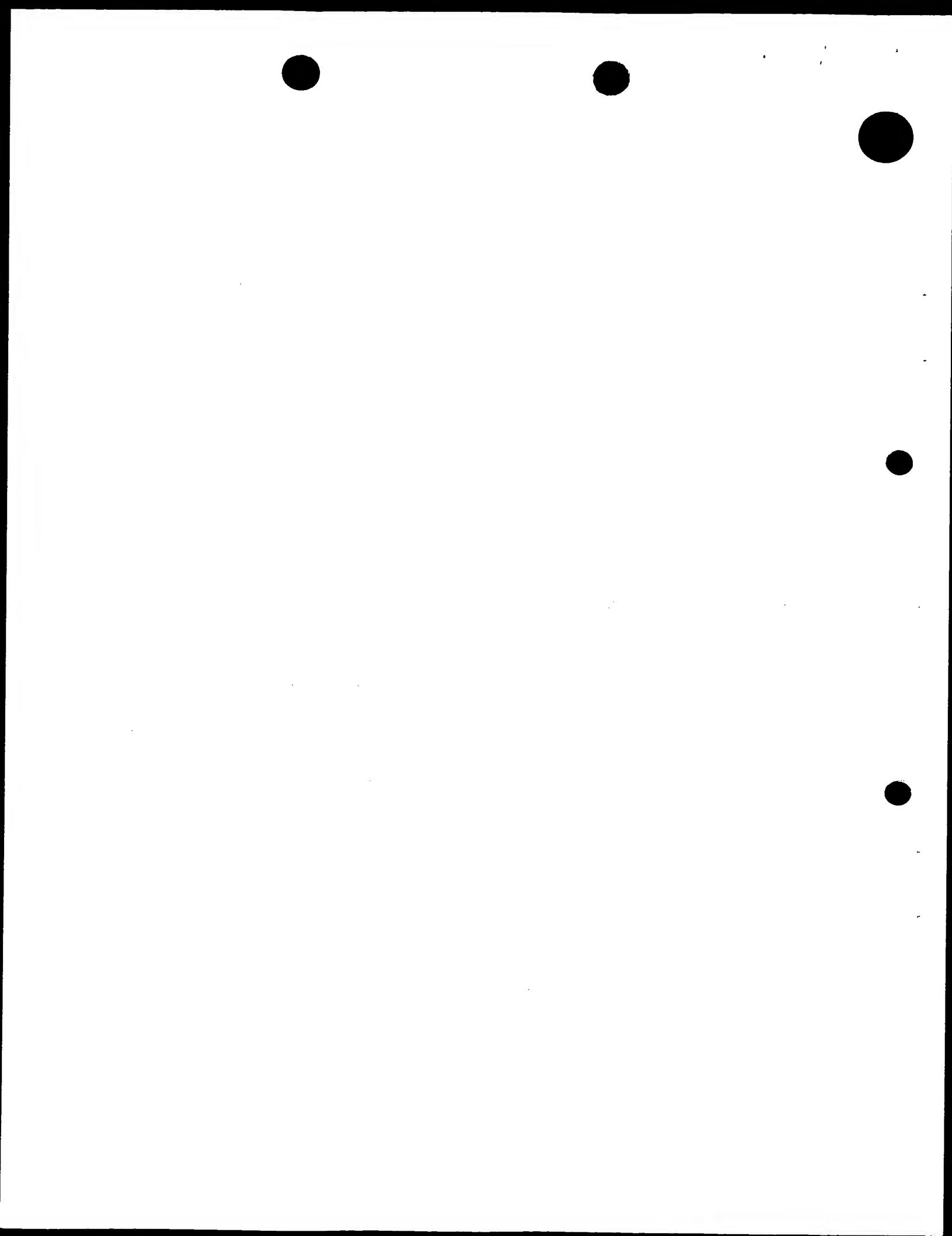
FIG 120
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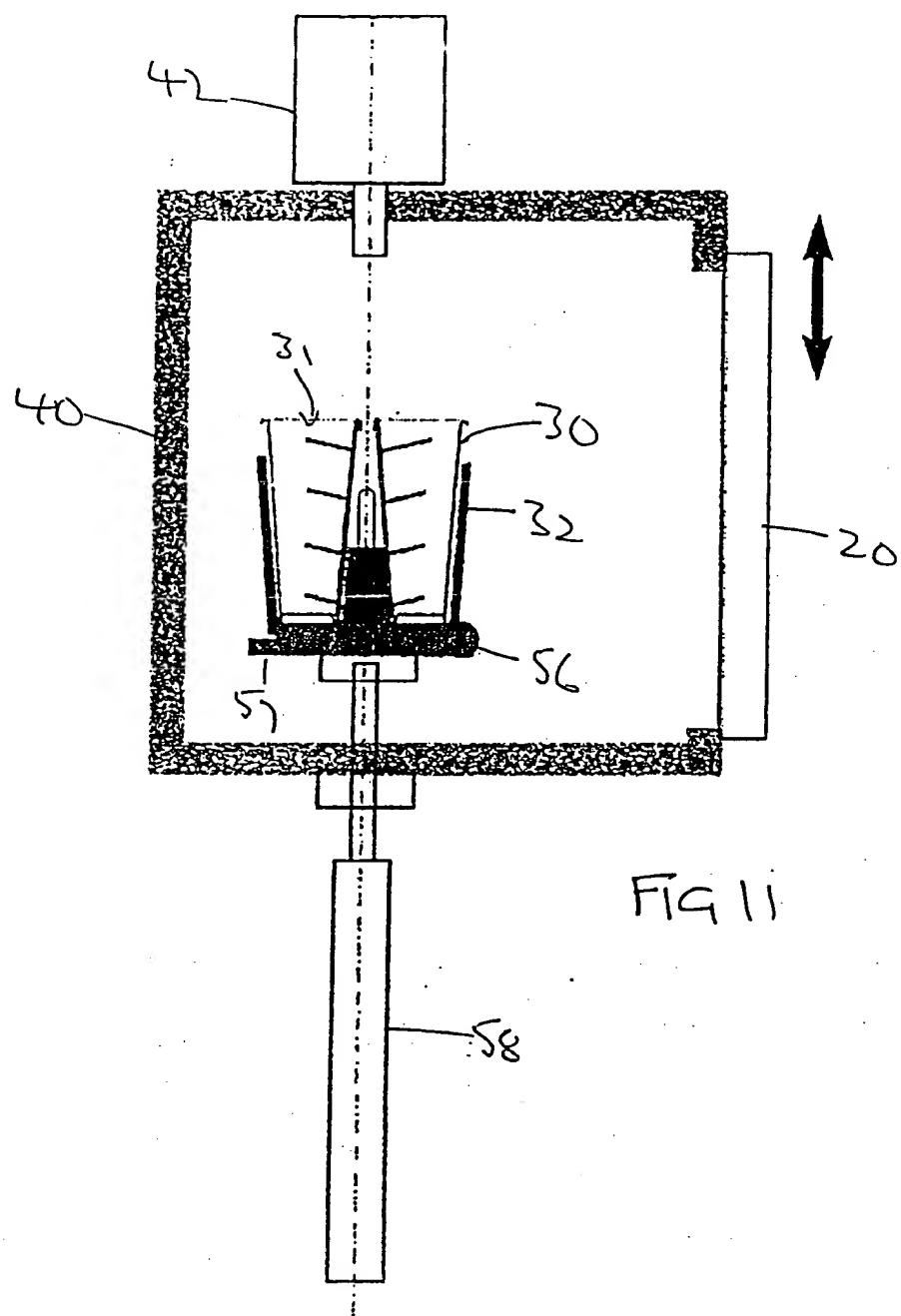
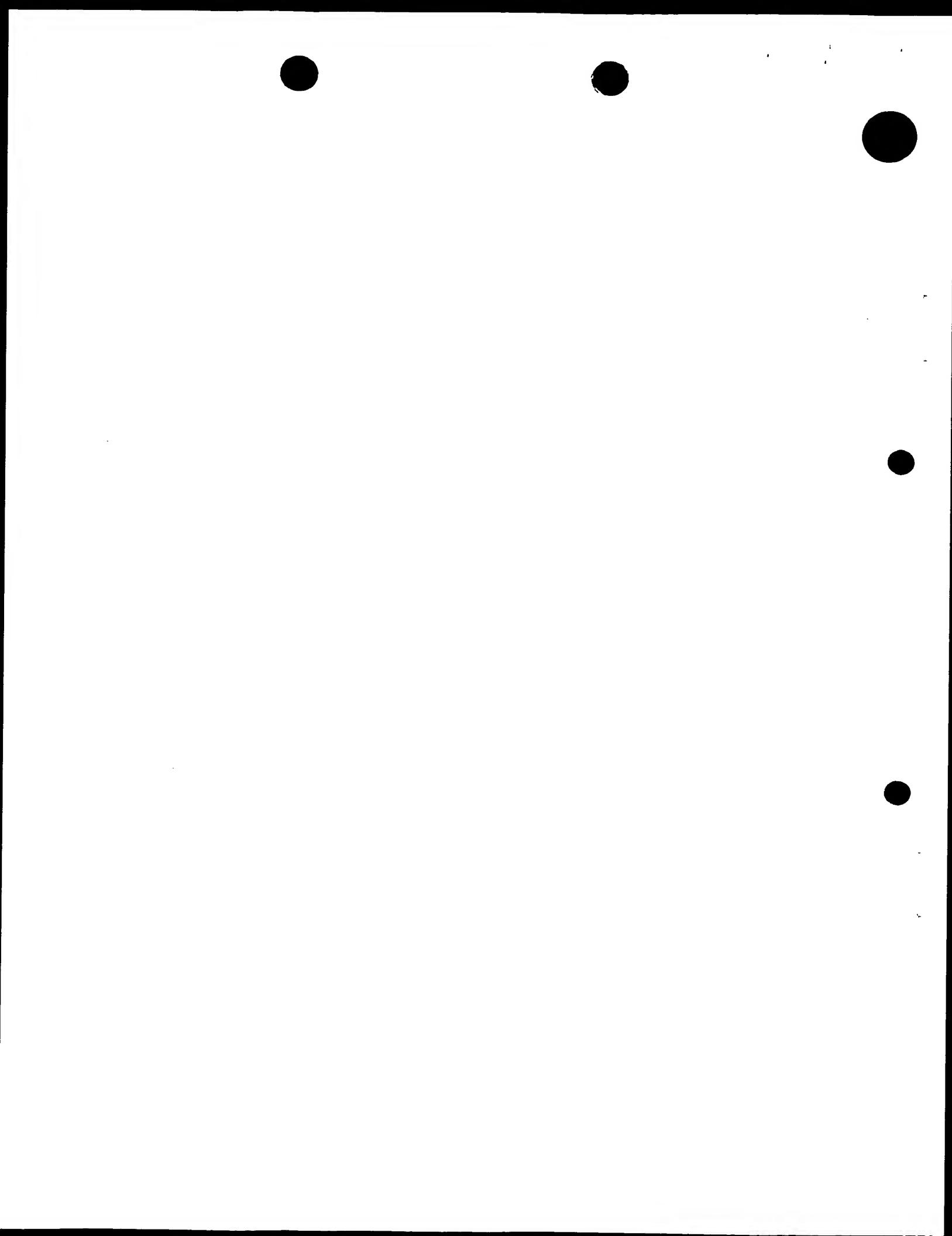


FIG 11



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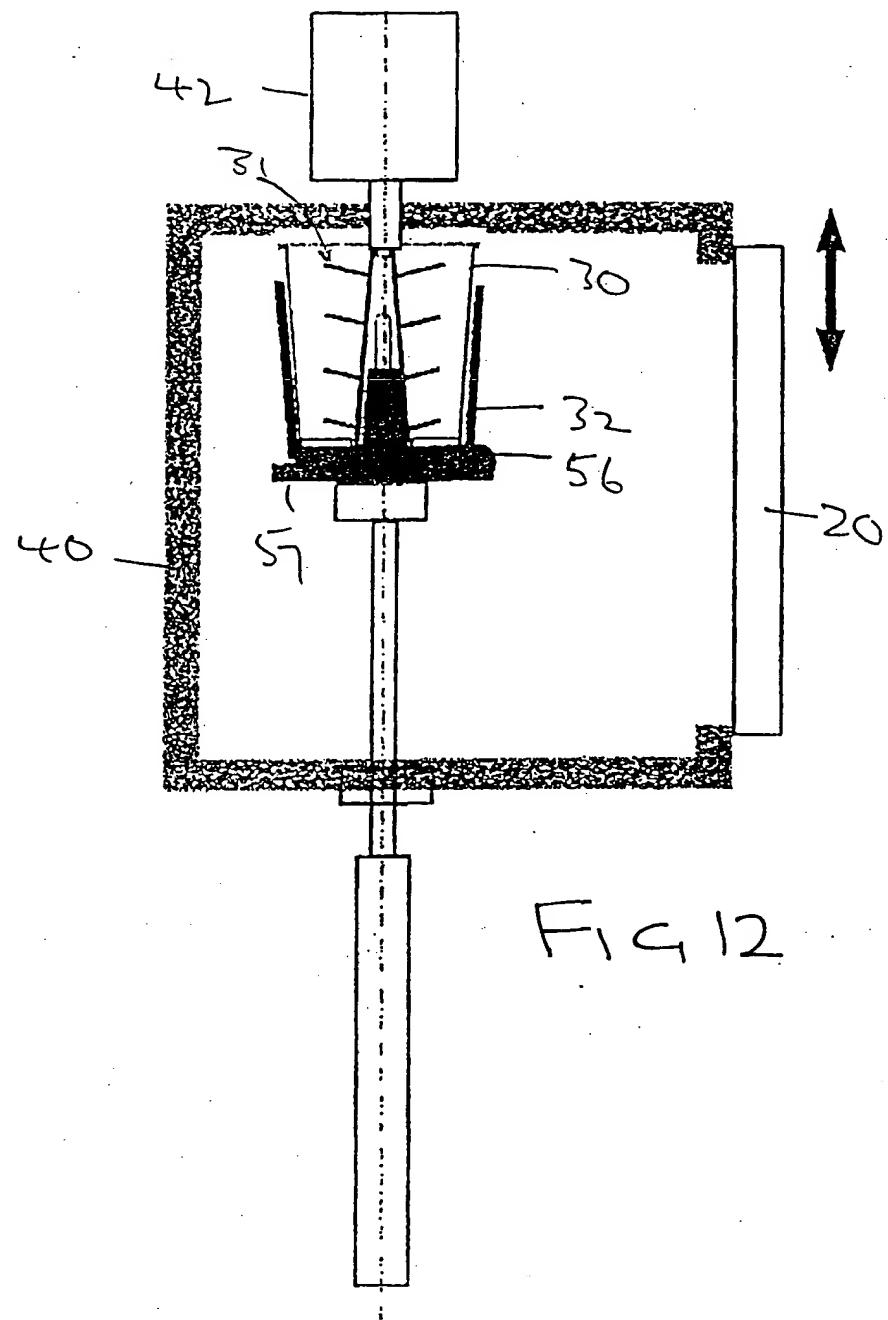
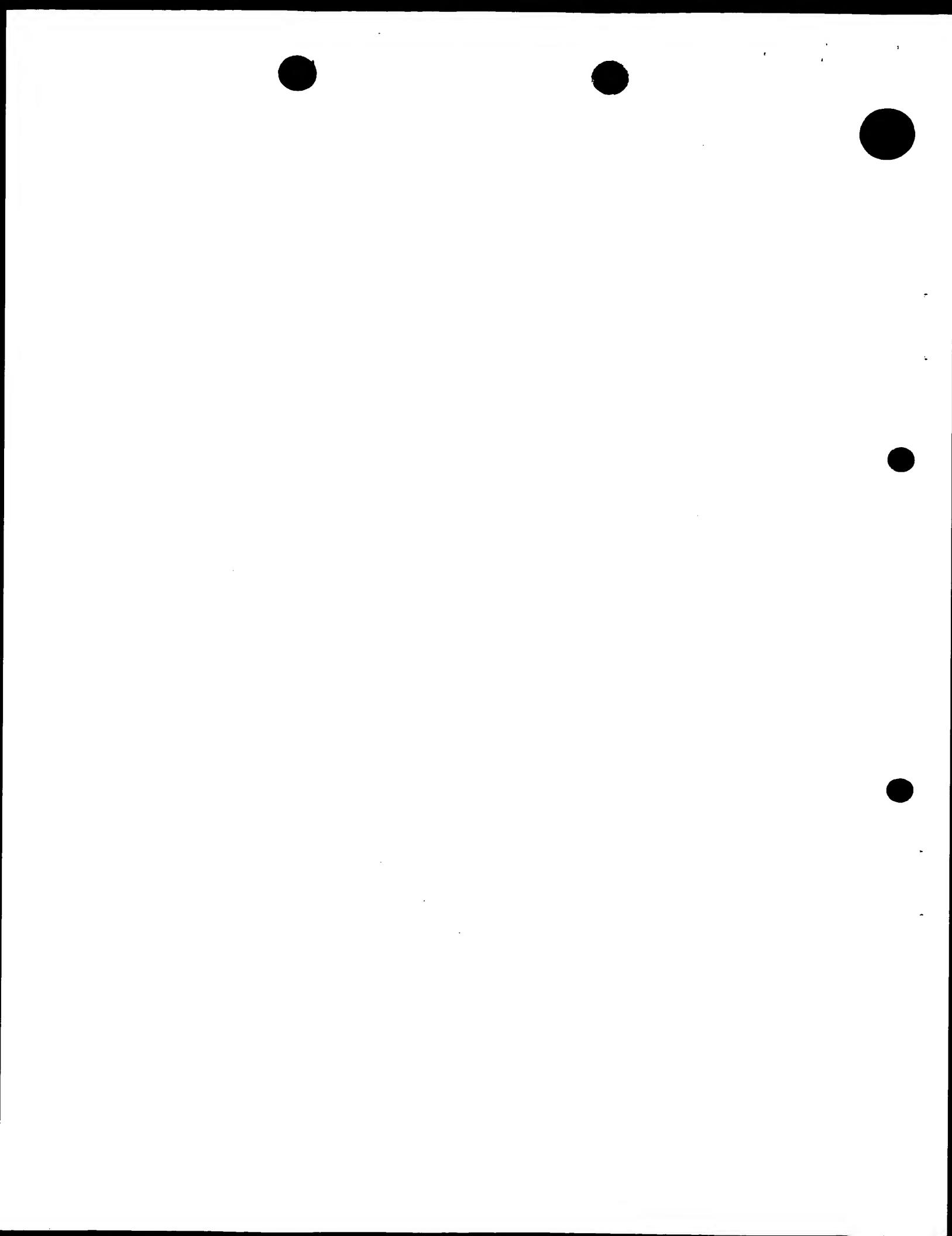


FIG 12



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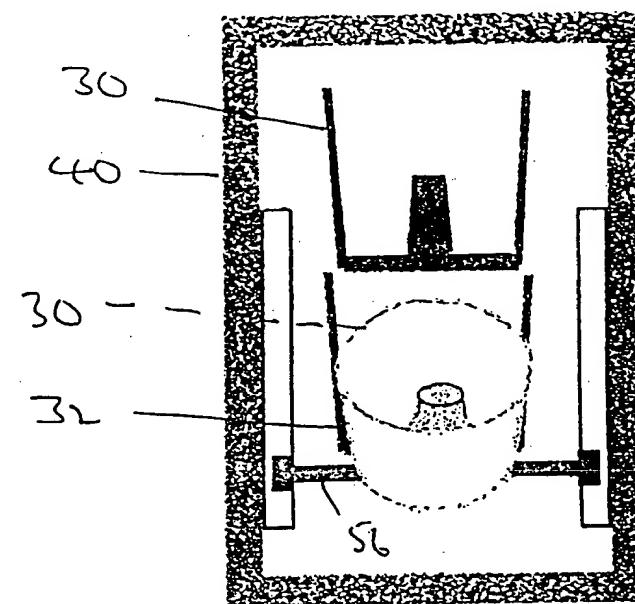


FIG 13

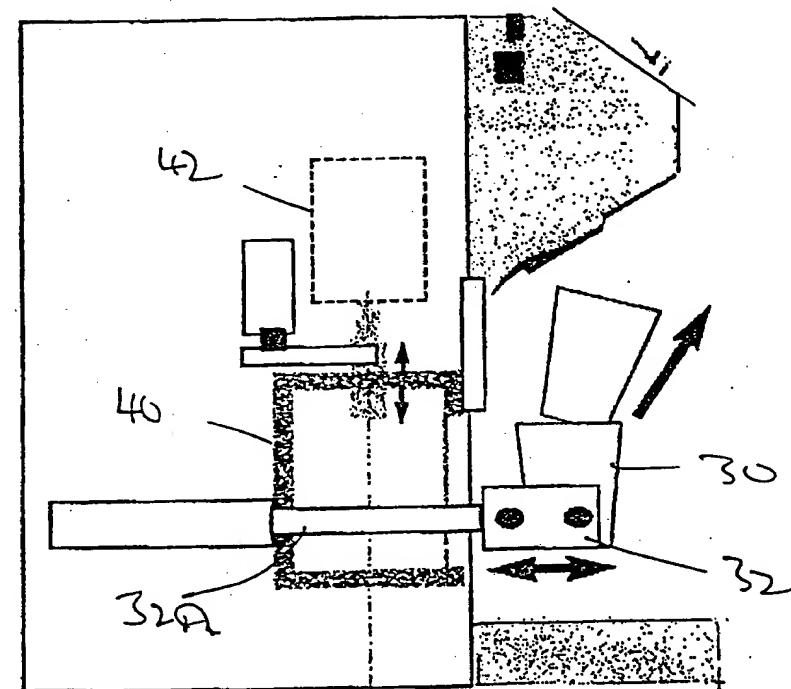
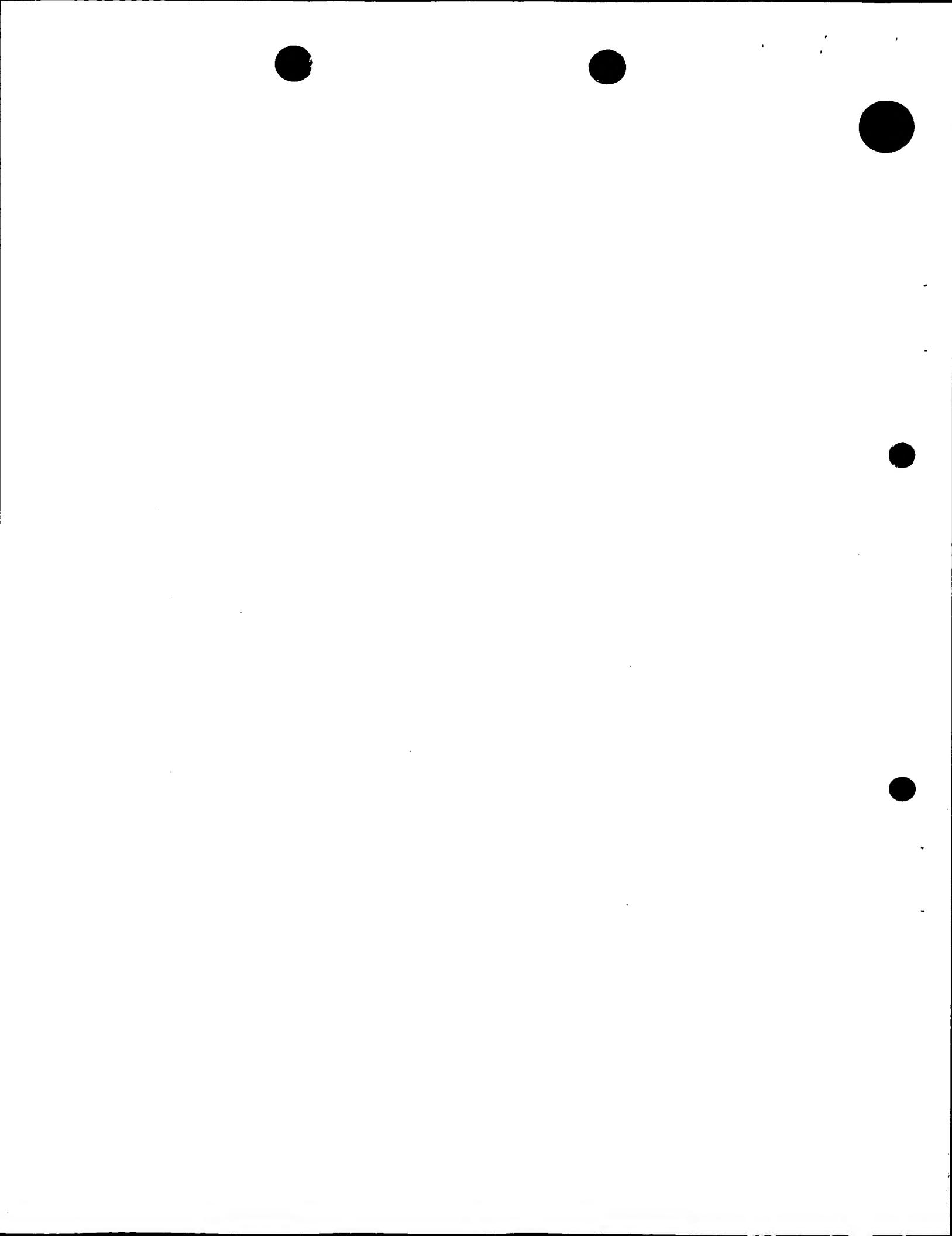
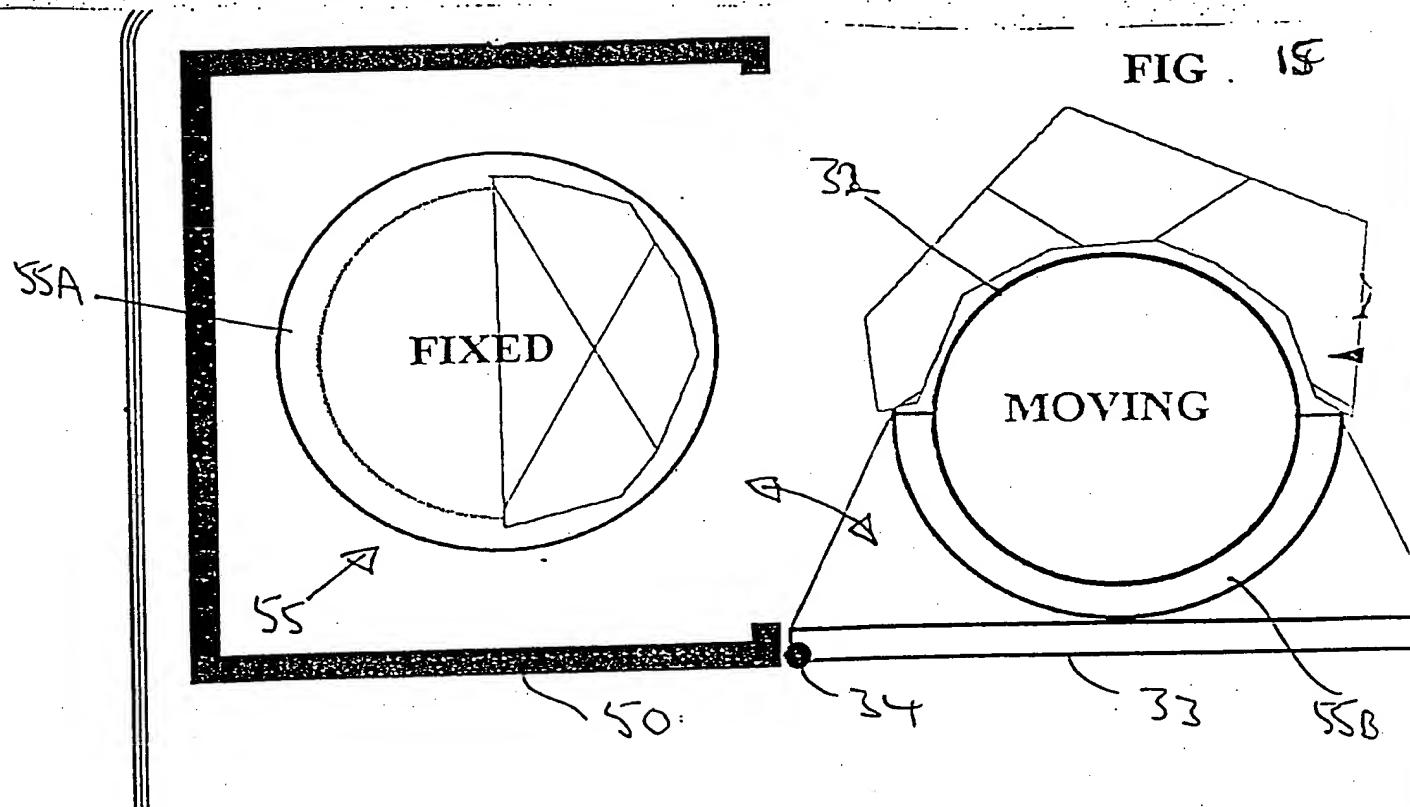


Fig 14



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FIG. 15



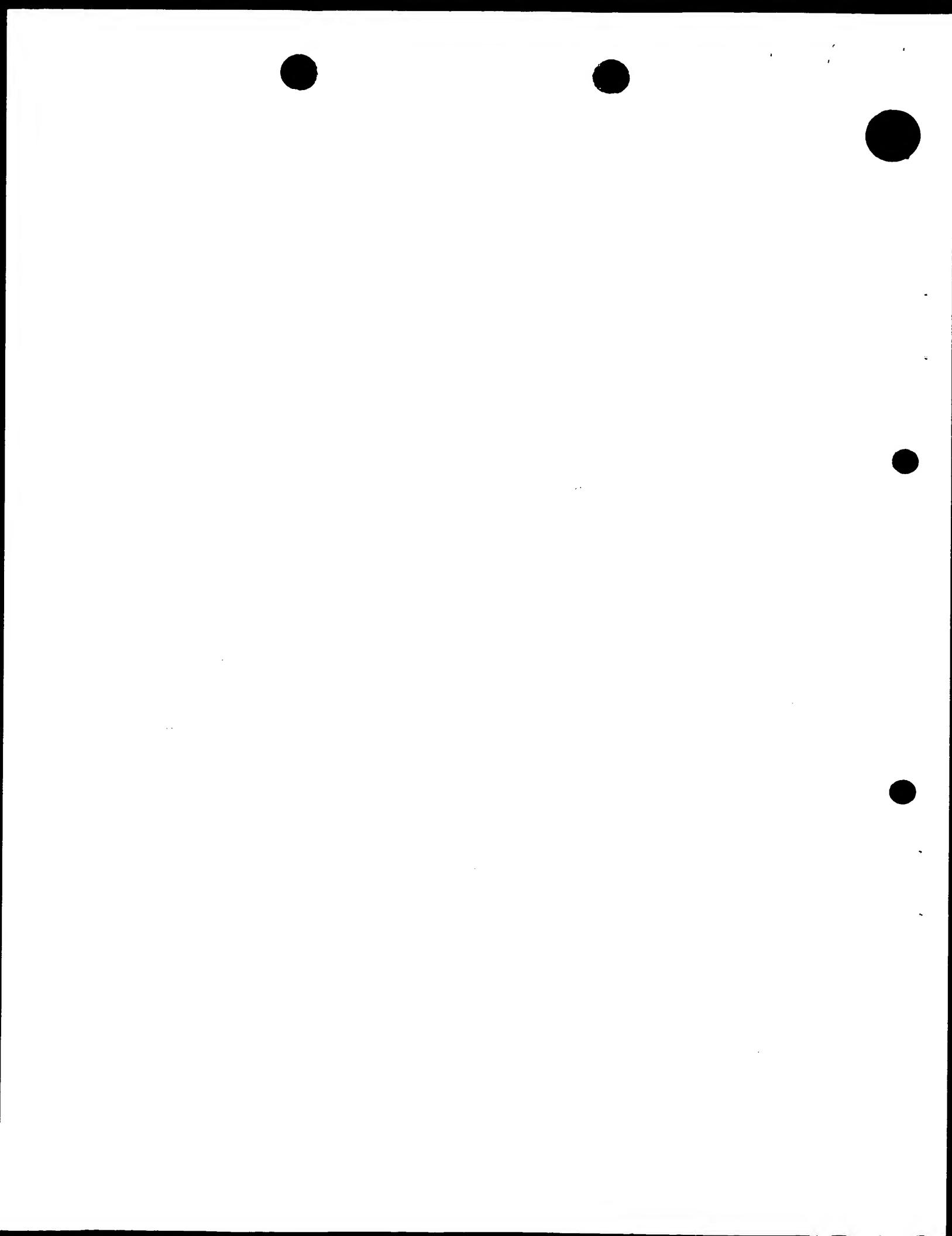


FIG. 16

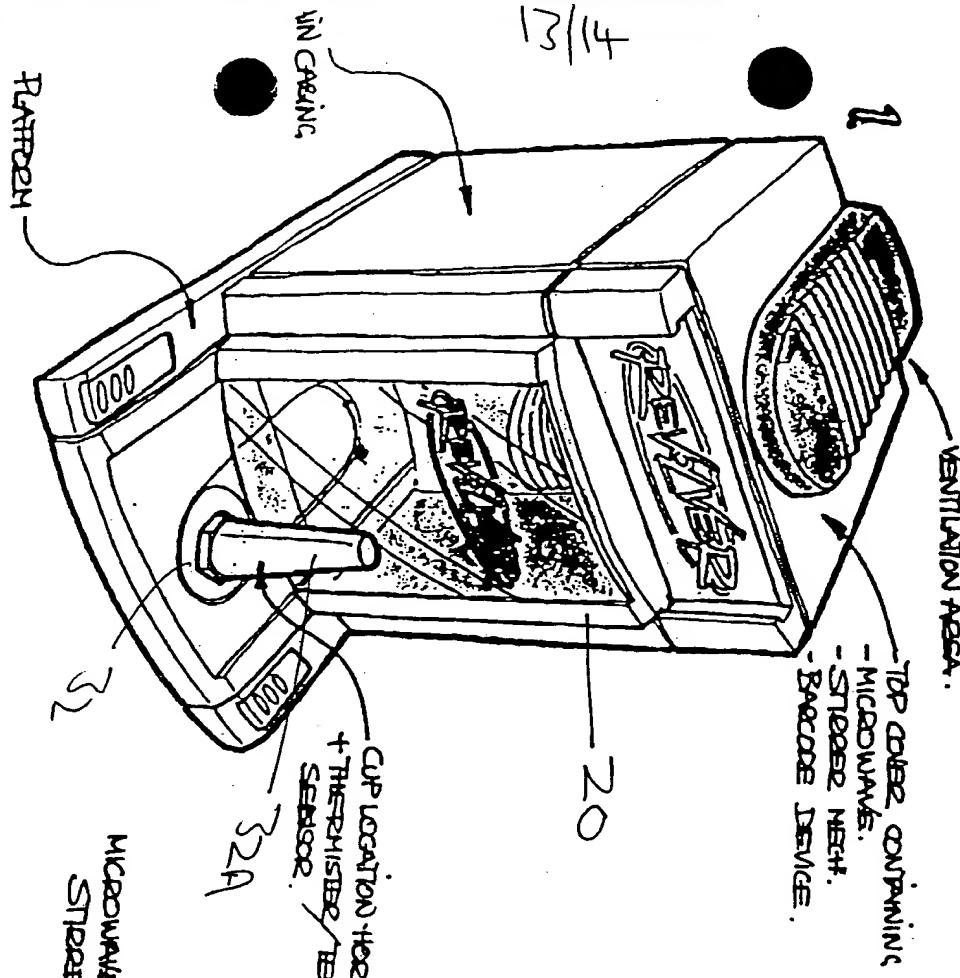
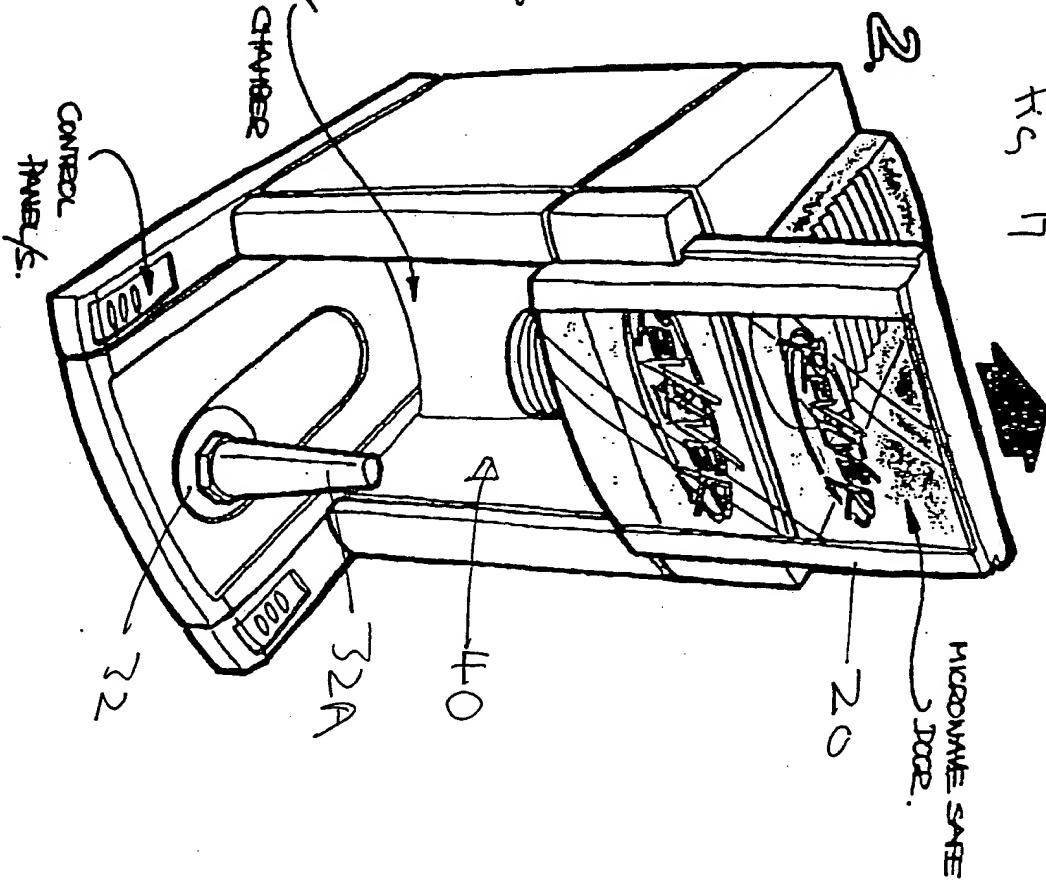
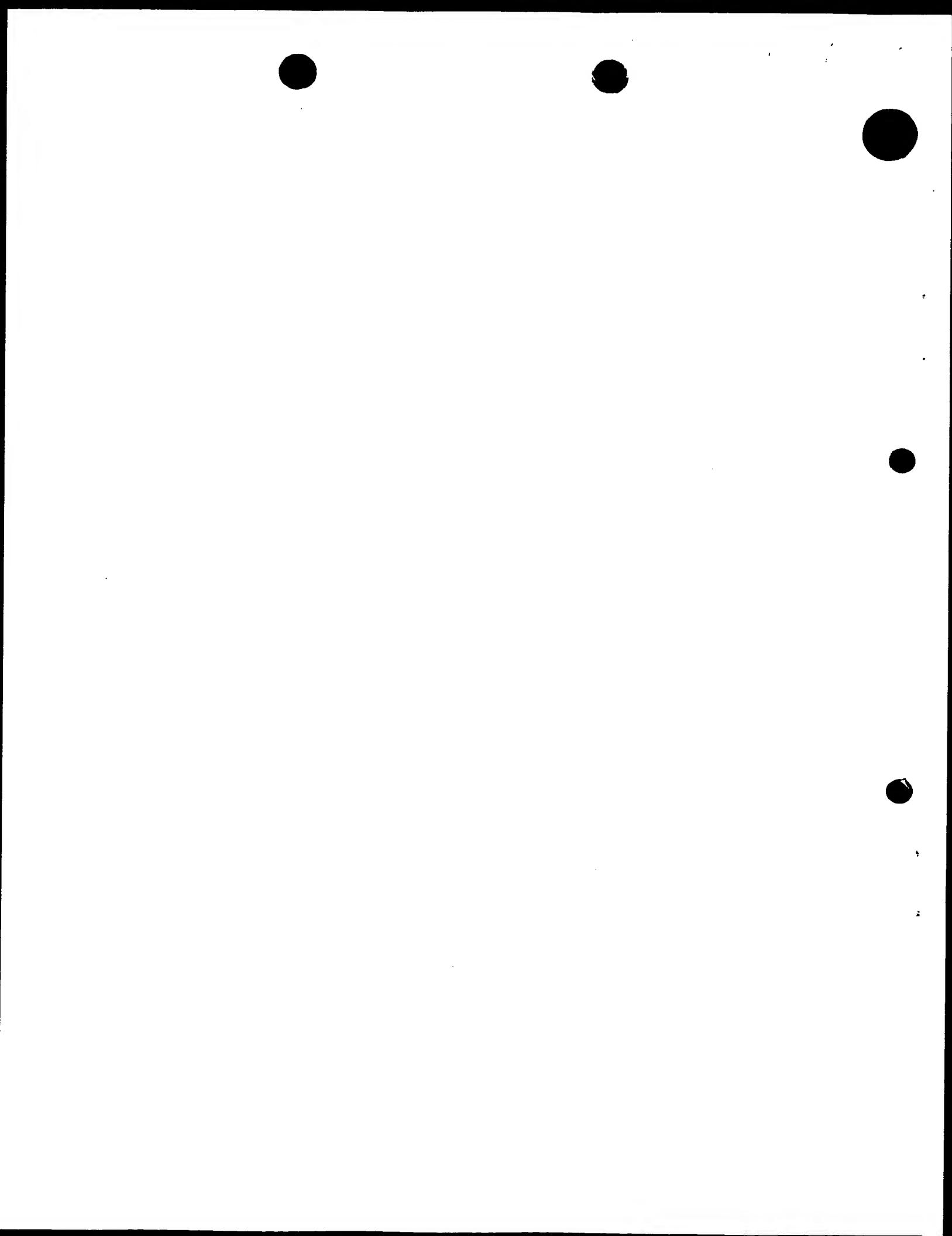
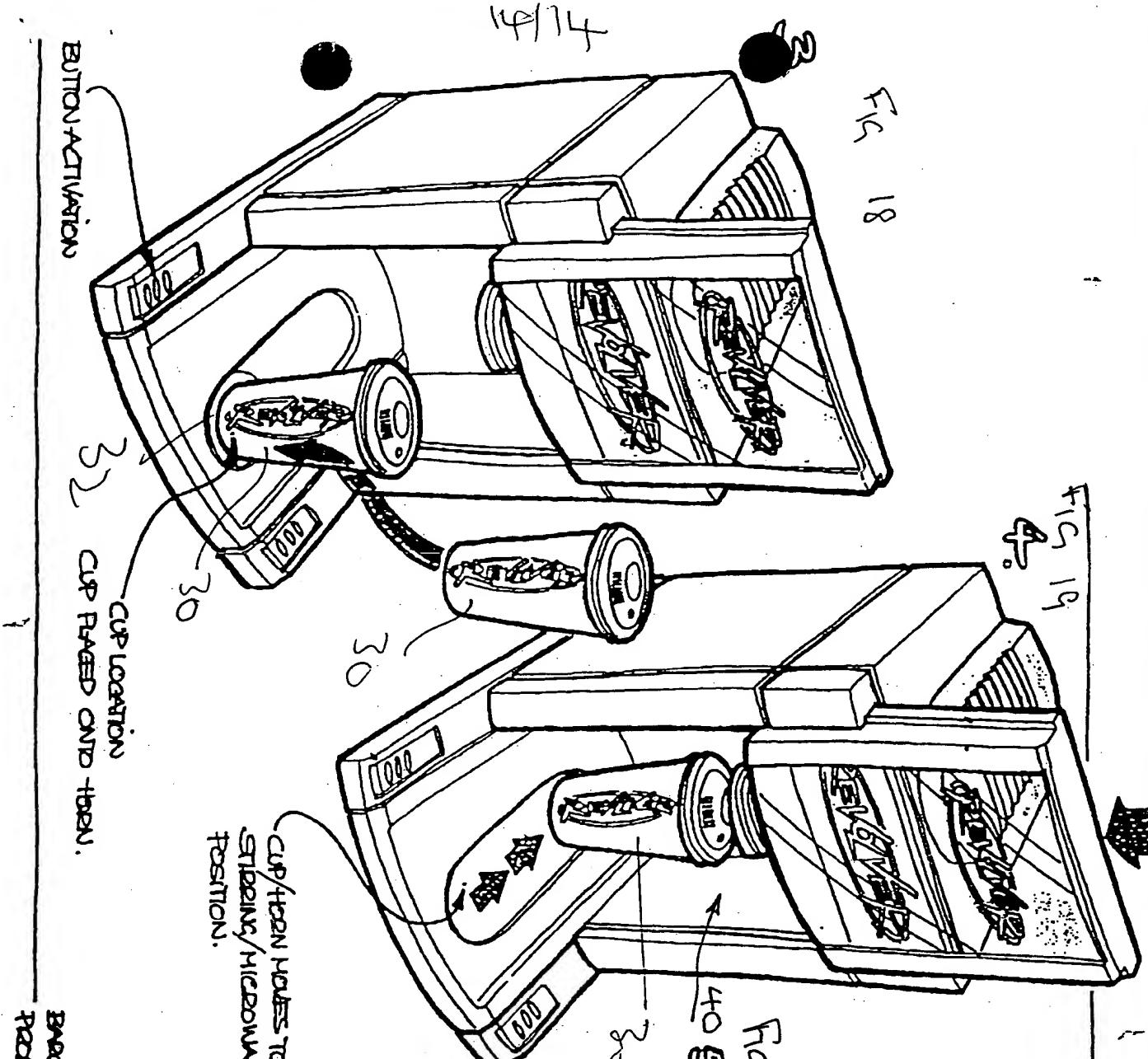
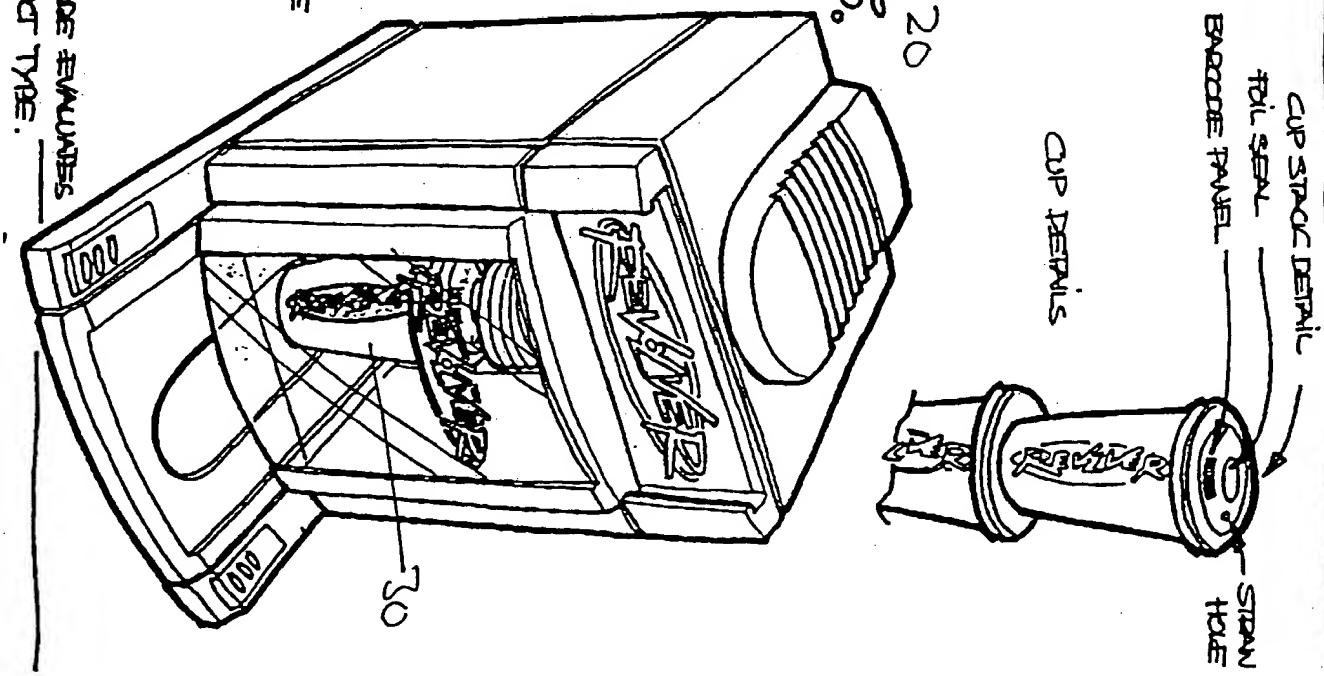


FIG. 17







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